Walden Dissertations and Doctoral Studies

2017

Translation and Validation of the Spanish Version of the Rapid Estimate of Adult Literacy in Dentistry-30

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Walden University
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Abstract

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by

Wilma Luquis-Aponte

MPH, University of Puerto Rico, School of Public Health, 1996

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

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Abstract

Low or marginal health literacy affect nearly 90 million citizens in the United States, compromising health outcomes, including oral health. Oral health literacy has been studied in diverse populations, yet the assessments used were developed and validated for English-speaking populations. A validated Spanish-language oral health literacy assessment was needed to help researchers and practitioners evaluate oral health literacy in the Hispanic population. Using the oral health literacy framework, the purpose of this study was to translate, culturally adapt, and validate a Spanish version of a previously validated English-language oral health literacy. A translation-back-translation process was applied to the English version of the REALD-30. Face and content validity were established using a panel of dental and health literacy experts. The Spanish version was field tested among Spanish-speaking community health center patients (*N*=114), and included a random subsample (N=11) to check for test-retest reliability. The results showed that the Spanish REALD-30 has a good internal reliability (=r=.687) and an acceptable convergent reliability (r =.857), when assessing health literacy against the SAHLSA-50. This study's implications for positive social change include providing the dental profession and research community with an assessment tool for oral health literacy. This tool may allow oral health professionals to understand the dynamics and challenges among Hispanics regarding oral health literacy, while the study fills an existing gap in scholarly literature.

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Dedication

To God all the glory as He has granted me the mental, emotional and physical health to pursue and achieve my goals. To my parents Rafael and Catalina, in whom I have the best life and professional role models. To my brothers and sisters and my extended family for believing in me. To my husband Mando and my children Gabriela, Adrianna and Alexander, my cheerleaders, my inspiration and my purpose. Thanks for allowing me to be absent when it was needed, for the hugs and kisses, and the pick-me-up moments. I can only hope this journey serve as an inspiration to you. Remember, nothing is granted, work hard for want you desire, believe in you. The sky is the limit!

Acknowledgments

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List of Abbreviations and Nomenclature

ADA: American Dental Association

IOM: Institute of Medicine

NALS: National Adult Literacy Survey

NIDCR: National Institute of Dental and Craniofacial Research

OHIP-14sp: Oral Health Impact Profile Spanish version

OHLI: Oral Health Literacy Instrument

REALD-30: Short version of Rapid Estimate of Adult Literacy in Dentistry

REALD-99: Long version of Rapid Estimate of Adult Literacy in Dentistry

REALM: Rapid Estimate of Adult Literacy in Medicine

REALM-R: Revised version of Rapid Estimate of Adult Literacy in Medicine

SAHLSA-50: Short Assessment of Health Literacy for Spanish-speaking Adults

SPSS Statistical Package for the Social Sciences

TOFHLA: Test of Functional Health Literacy of Adult

TOFHLiD: Test of Functional Health Literacy in Dentistry

Chapter 1: Introduction to the Study

I conducted a cross-sectional study designed to validate a Spanish-language oral health literacy tool, and to examine oral health literacy, dental care knowledge, self-perceived oral health status, dental care practices, and existing barriers in relation to dental care in the Hispanic population. In this chapter, I present a background on the context of health literacy, oral health literacy, and the Hispanic population. This chapter also includes a discussion of the conceptual framework from which I built this study, the problem statement, and the significance of the study. I designed this chapter to provide the reader initial exposure to the purpose of the study, and to introduce the study design and research questions that I used to guide my research.

Background of the Study

The Hispanic population is the fastest growing minority group living in the United States, and the majority of this population is primarily Spanish speaking (U.S. Census, 2011). As of 2010, Hispanics accounted for 50.5 million (16%) of the U.S. population (Ennis, Rios-Vargas, & Albert , 2011). Reports from the U.S. Census (2010) showed that the Hispanic population is estimated to grow to approximately 102 million by the year 2050. Ennis, Rios-Vargas, and Albert's (2011) report based on the 2010 U.S. Census showed that 8 of the 50 United States each have over a million Hispanic residents. Among these states, California and Texas have the highest percentages of Hispanic residents (Pew Hispanic Center, 2011).

Between the years 2000 and 2009, the population of Texas experienced an 18% growth from 20,851,818 to 24,782,302 residents (U.S. Census, 2010). About 36%, or

8,866,000 of the residents, are Hispanic. There are five regions in the state identified as having the highest concentrations of Hispanic populations: the Alamo, Gulf Coast, North Central Texas, and the Lower and Upper regions of the Rio Grande Valley (Hispanic Research Center, UTSA, 2000). According to the U.S. Census (2010), each of these regions also has a county where the Hispanic population is comparatively high. These counties are Bexar, Harris, Dallas, Hidalgo, and El Paso.

Socioeconomic Profile of Hispanic Population

Poor health outcomes and disparities among the Hispanic population are a result of multiple contributing factors, including socioeconomic, demographic, environmental, social, and cultural factors such as education, immigration, and language. Because of these barriers, the Hispanic population faces a higher risk of not being able to access proper health care or navigate the health care system, either in general or problem-specific. In the remainder of this section, I draw on statistics to show how health literacy is central to projects working to reach out to this population to improve oral health outcomes.

Socio-economic profiles of the nation's Hispanic population indicate that legal residency is a contributing factor for poor health outcomes as nearly 3% of the Hispanics living in the United States are not officially documented as residents or citizens, although they constitute more than 5% of the nation's workforce (Passell & Cohn, 2011). Three out of 10 Hispanics live at or below the official poverty threshold issued by the Census Bureau, compared to 13.8% of the general population (Lopez & Cohn, 2011; Short, 2011).

Poverty and health insurance coverage are intricately linked in the United States; 30.1% of Hispanics do not have health insurance, compared to 15.7% of the general population (DeNavas-Walt, Proctor, & Smith, 2012). Additionally, 32% of Hispanics under the age of 17 live at or below the poverty level, and 9.4% of Hispanics under the age of 18 do not have health insurance (DeNavas-Walt, Proctor, & Smith, 2012). When compared to the general population, the U.S. Hispanic population, especially children, is more likely to not have insurance and to live below the poverty level. In Texas, 37% of Hispanic residents do not have health insurance, which is higher than the percentage for the overall U.S. Hispanic population (CDC, 2012; DeNavas-Walt, Proctor, & Smith, 2012). Furthermore, 32% of Texas Hispanic residents under the age of 17 live at or below the poverty level, and 17% of Texas Hispanic residents under the age of 17 do not have health insurance (Kaiser Foundation, 2012).

The average Hispanic has a low level of educational achievement when compared to the rest of the population. Lopez (2009) found that Hispanics have 33% college enrollment, which is lower than that of the general population (42%). Although the Hispanic population under the age of 25 recognized college education as important, 61% of the adult Hispanic population over the age of 26 saw the lack of parental support as a determining factor for staying in school and continuing higher level education (Lopez, 2009). In Texas, only 45% (or 2,137, 000) of the Hispanic population have received or are receiving education at the K-12 level, with three times the rate of high school dropouts when compared to non-Hispanic White students for the year 2010 (Texas

Education Agency, 2011). These statistics are particularly important since at least half of the Hispanic population in the U.S. is under 35 years of age (Motel, 2012).

Other findings regarding the Hispanic population concern the health status of this population and its members' inability to navigate the health care system. Hispanic women are two times more likely to have late or no prenatal care than non-Hispanic White women (12.2% to 5.3%; Centers for Disease Control and Prevention, 2011). The Hispanic population shows a high prevalence of diabetes (11%), obesity, and sedentary lifestyles compared to other races, in addition to a high prevalence of dental caries and periodontal diseases (Watson & Brown, 1995). Furthermore, the percentage of this population that holds health insurance is below 35% (Adams, Martinez, Vickerie & Kirzinger, 2011; DeNavas-Walt, Proctor & Smith, 2008), and only 68% of Hispanics visit a doctor or access care from other health professionals (National Center for Health Statistics, 2011).

Furthermore, members of the Hispanic population faces other challenges that prevent them from acquiring adequate health care. Literacy skills (such reading and numeracy), the ability to speak fluent English, and educational attainment are generally lower among the Hispanic population, creating a substantial barrier to effective health care (Kutner, Greenberg, Jin, & Paulsen, 2006). In addition, this population encounters difficulties communicating with and understanding their health care providers, obstructing the processing of health information needed to navigate the system and make decisions regarding health issues (Doty, 2003; Timmins, 2002). The phenomenon described in these studies and reports is known as low or marginal health literacy.

Health Literacy

Health literacy is defined as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (U.S. Department of Human Health and Services [DHHS], 2000a, p. 20; see also, Selden, Zorn, Ratzan, & Parker, 2000). Recently, health care providers and the public health community have been discussing the role of health literacy in the outcome of the population's health. According to existing literature (Institute of Medicine, 2004), 90 million U.S. residents are affected by low or marginal health literacy, placing them at a disadvantage regarding their health status, their ability to make informed decisions, and their capacity to interact with their health care providers. Individuals with limited health literacy not only have fewer skills to manage their medical conditions (Mancuso, 2010; Paasche-Orlow, et al., 2005b; Shone, Conn, Sanders, & Halterman, 2009; Williams, Baker, Parker, & Nurss, 1998), but also seek and receive less preventive care (McCray, 2005; Pawlak, 2005; White, Chen, & Atchison, 2008). These individuals demonstrate less ability to navigate the health care system (Baker, et al., 1996) are more likely to be hospitalized (Baker, et al., 1998), and experience less ability to access care.

The focus directed at health literacy has permeated into the dental field, as oral health has been identified in *Healthy People 2010* and *2020* as a priority and objective in achieving a healthy status among United States citizens. Oral health is fundamental in order for an individual to attain overall health and well-being (DHHS, 2000c; Griffin, Barker, Griffin, Cleveland, & Kohn, 2009). Poor oral health affects several aspects of a

person's life, including their mental, psychological, and physical status. Poor oral health is associated with a host of negative outcomes such as pain, infection, low school and job performance, and low self-esteem, and it influences other existing systemic disorders. Based on the previous facts and the health literacy definition, oral health literacy was defined as "the degree to which individuals are capable of obtaining, processing and understanding basic health information in order to make appropriate dental health decisions" (DHHS, 2000a, p.39). In addition, a conceptual framework (National Health Institute, 2005;see Figure 1) was constructed based on determinants that might affect oral health literacy levels, thus having an impact on individual oral health outcomes and the costs of treating otherwise preventable diseases and conditions. Among those factors are culture and society, the health system, and the education system (Nielsen-Bohlman, Panzer, & Kindig, 2004).

Health Literacy and Oral Health

In addition to the previously noted issues, low oral health literacy could also have an impact on oral diseases, thus complicating oral health outcomes. This impact can exacerbate other existing chronic medical illnesses by preventing the individual from seeking preventive care, making assertive decisions regarding their oral health care, and conducting the necessary compliance with instructions and medication adherence. Research has been done to assess the levels of oral health literacy and establish its relationship with knowledge, attitudes, and dental care in some populations (Atchinson, Gironda, & Der-Martisosian, 2010; Gong, et al., 2007; Jones, Lee, & Rozier, 2007; Bender & Ruiz, 2007; Parker & Jamieson, 2010; Richman et al., 2007; Sabbahi et al.,

2008). Even though these authors have explored oral health literacy in diverse

populations, the tools available to perform this task are written and constructed for the

English-speaking population. The literature presents no evidence of the existence of a

validated Spanish version of any of the available tools, thus preventing the accurate

assessment of oral health literacy levels in other populations such as the Hispanic

population.

Problem Statement

The U.S. Hispanic population experiences low levels of health literacy (Selden,

Zorn, Ratzan, & Parker, 2000), has high prevalence of oral disease, and faces challenges

in acquiring health insurance and navigating the health care system. The demographic

profile of Hispanics further contributes to lower socioeconomic status than other

minorities in the United States including income, educational attainment, legal residency,

and poverty. Given the diversity of the racial/ethnic population of the United States, not

enough attention has been given to health literacy. The few tools that have been

developed are generally in English. There has been no research validating an oral health

literacy screening tool for the non-English or limited English proficiency (LEP) speaking

Hispanic population. The demographic projections for the Hispanic population indicate

that bilingual health literacy measures will improve access to health and health outcomes.

Without a validated Spanish-language oral health literacy assessment, it is difficult for

dental professionals and researchers to determine oral health needs and establish the

relationship of oral health literacy with socio-demographic factors, dental knowledge,

attitudes, and perceived oral status in the Hispanic population.

Purpose of the Study

The purpose of this study was to translate, culturally adapt, and validate a Spanish version of an oral health literacy assessment tool. In this research, I used a translation-back-translation procedure and field testing with a random subsample to determine the validity and reliability of the translated assessment for use in the Hispanic population in a southwestern state of the United States.

Nature of the Study

I chose a quantitative research method for this study. This method allowed me to assess the validity and reliability of the translated oral health literacy assessment. In this study, I relied on the use of an existing oral health literacy assessment tool and previously translated and validated health literacy and oral health quality of life instruments to collect the necessary information to answer the research questions.

I conducted this study using the theoretical framework for oral health literacy described in the National Institutes of Health report on oral health literacy (NIH, 2005). Specifically, I sought to validate a Spanish language translation of a previously validated tool, the Rapid Estimate of Adult Literacy in Dentistry (REALD-30), for Hispanics in a large southern state of the United States. The instrumentation used in this study included the translated, back-translated Spanish version of the REALD-30 questions on participant demographics, the Short Assessment of Health Literacy for Spanish-speaking Adults ([SAHLSA-50]; Lee, S.D., Bender, D.E., Rafael E. Ruiz, R.E., & Cho,Y.I., 2006), and the Spanish version of the Oral Health Impact Profile ([OHIP-14sp]; Montero-Martín, J.,

Bravo-Pérez, M., Albaladejo-Martínez, A., Hernández-Martín, L. A., & Rosel-Gallardo, E. M., 2009).

Analysis of the collected data included descriptive statistics and validation of the translated instrument by the use of Cronbach's alpha factor analysis, Spearman's correlation, and ordinary least squares regression to determine the reliability and validity of the translated instrument. I offer further explanation and details of the research design and analysis in Chapter 3.

Research Questions

The objectives of the study were: (a) to linguistically and culturally translate an oral health literacy assessment tool from English to Spanish, and (b) to determine the validity and reliability of the Spanish-translated oral health literacy assessment tool. This study was guided by two main questions and five subquestions with corresponding hypotheses, where applicable, related to the main questions:

RQ1: Is the SREALD-30 a valid tool for assessing oral health literacy among Spanish-speaking community health center patients?

RQ1a: Does the SREALD-30 score predict oral health quality of life as measured by the OHIP-14sp? (Predictive validity)

H01a: The SREALD-30 score does not predict oral health quality of life as measured by the OHIP-14sp.

HA1a: The SREALD-30 score predicts oral health quality of life as measured by the OHIP-14sp.

RQ1b: Does the SREALD-30 score predict oral health status? (Predictive

validity)

H01b: The SREALD-30 score does not predict oral health status.

HA1b: The SREALD-30 score predicts oral health status.

RQ2: Is the SREALD-30 a reliable tool for assessing oral health literacy among

Spanish-speaking community health center patients?

RQ2a: Does the SREALD-30 have good internal reliability?

RQ2b: Are the SREALD-30 test-retest scores correlated?

H02b: The SREALD-30 test-retest scores are not correlated.

HA2b: The SREALD-30 test-retest scores are correlated.

RQ2c: Does the SREALD-30 have good convergent reliability with health

literacy as measured by the SAHLSA-50?

Conceptual Framework

According to Ulin, Robinson, and Tolley (2005), the use of a conceptual

framework allows for structure of the study and demonstration of theory. It also guides

the researcher in the selection of appropriate variables, association between variables, and

the selection of suitable strategies for data collection and analysis.

Two frameworks (see Figure 1, Figure 2) for health literacy were developed in

2002 by the Health Literacy committee in the report *Health Literacy: A Prescription to*

End Confusion (Institute of Medicine [IOM], 2004). These frameworks presented health

literacy as a subdivision of general literacy, a multi-dimensional concept influenced by an

individual's skills, social dynamics, and external or environmental factors. According to

this report, literacy provides the individual with skills that allow for the interaction

between the individual and the health care environment. This interaction is mediated by

factors associated with the immediate environment and social context where a person

interacts.

Health Literacy Framework
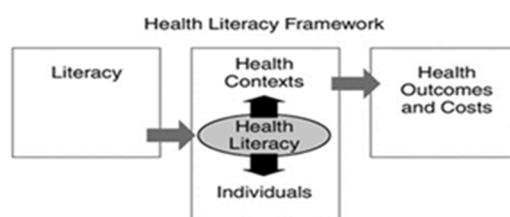
Figure 1. Health literacy conceptual framework. Adapted from *Health literacy: A prescription to end confusion*, by L. Nielsen-Bohlman, A. M. Panzer, and D. A. Kindig, 2004, p. 33. Copyright 2004 by The National Academies Press.

Potential Intervention Points
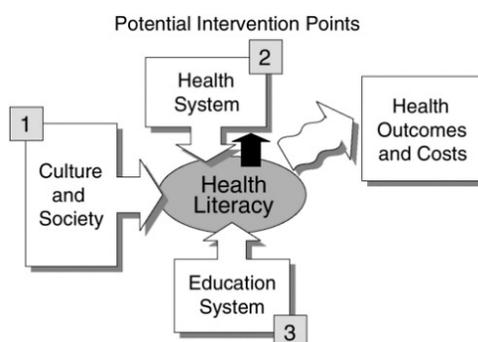
Figure 2. Potential points for intervention in the health literacy framework. Adapted from *Health Literacy: A prescription to end confusion.* by L. Nielsen-Bohlman, A. M. Panzer, and D. A. Kindig, 2004, p. 34. Copyright 2004 by The National Academies Press.

The conceptual framework of this study (see Figure 3) concerns oral health

literacy and the relationship of identified factors, as well as the effect over oral health

outcomes. I used it as a foundation for understanding the mechanisms related to oral

health literacy and its overall social and individual impacts on oral health outcomes.

Figure 3. Oral health literacy framework. Adapted from: *Oral Health Literacy: The New Imperative to Better Oral Health.* A. M. Horowitz, D. V. Kleinman. p. 335. Copyright by Elsivier 2008.

Cultural and societal factors, as well as individual beliefs, are determinants of health literacy, and most of these factors are out of the individual's control (Kutner, Greenberg, Jin, & Paulsen, 2004). Among the factors that people cannot control are their native language, gender, race, and ethnicity. These characteristics affect the ability of an individual to respond and actively participate in the development of a health literate interaction with the health provider and the health care system.

Cultural influences affect how people acknowledge, communicate, and understand health information, the perception of their own health status, and how and from whom they will receive health care. Culture also has an effect on acceptance and compliance with recommendations regarding health behavior and lifestyles changes.

The educational system's role in the present framework consists of the proposed development of an individual's numeracy, reading, and comprehension skills—mostly in an English-speaking curriculum that goes from grades K-12. It also represents the adult educational programs targeting those needing to improve their writing and reading skills, or those with Limited English Proficiency (LEP). Individuals who drop out of school and never complete an equivalency diploma, or those whose native language is other than

English will lack basic literacy skills fundamental for the development of health literacy. Even when adults follow educational programs to improve reading and writing skills, a significant percentage of those enrolled will drop out during the first third of the required completion hours (Kutner, et al 2004).

The U.S. health system is complex and consists of several components such as hospitals, clinics, welfare programs, regulatory agencies, and insurance management agencies. For an individual who lacks the necessary knowledge or skills to navigate the system, it is almost impossible to access the appropriate health care facilities and agencies. This lack of access prevents the individual from making the correct decisions about health and therefore affects the health outcome, leading to overutilization of services. This overutilization of services will in turn cause an increase in medical expenses for the patient, as well as the system. In Chapter 2, I discuss the conceptual framework in detail.

Definition of Terms and Variables

Acculturation: "Cultural modification of an individual, group, or people by adapting to or borrowing traits from another culture" (Merriam-Webster Dictionary, 2011).

Dental knowledge: The understanding of dental terms and conditions affecting the oral health.

Educational level: Represents a location on the education "ladder," that is, the progression from very elementary to more complicated learning experiences. This level

includes all fields and programme groups that may occur at that particular stage of the

progression (Glossary of Statistical Terms, 2003).

Health: "A state of complete physical, social and mental well-being, and not

merely the absence of disease or infirmity" (WHO, 1998, p. 1).

Health literacy: "The degree to which individuals have the capacity to obtain,

process, and understand basic health information and services needed to make

appropriate health decisions" (DHHS, 2000a, p.20).

Health outcomes: "A change in the health status of an individual, group, or

population which is attributable to a planned intervention or series of interventions,

regardless of whether such an intervention was intended to change health status" (WHO,

1998, p. 10).

Health status: "A description and/or measurement of the health of an individual or

population at a particular point in time against identifiable standards, usually by reference

to health indicators" (WHO, 1998, p. 12).

Hispanic or Latino: Refer to a person of Cuban, Mexican, Puerto Rican, South or

Central American, or other Spanish culture or origin regardless of race (U.S. Census

2011a, p. 2).

Oral health literacy: "The degree to which individuals have the capacity to

obtain, process and understand basic health information and services needed to make

appropriate oral health decisions" (DHHS, 2000a, p.39).

Oral health outcomes: "Clinical assessments by dental care professionals, people's perception of their health status, as well as the population's satisfaction with the care they received" (Andersen & Davidson, 1997, p. 207).

Pilot tests: "'Dress rehearsals' of full survey operations that are implemented to determine whether problems exist that need to be addressed prior to putting the production survey in the field" (Rothgeb, J. M., 2008, p. 584).

Population of the study: Defined by the researcher for the purpose of this study as adults of Hispanic origin.

Reasons to visit the dentist: Defined by the type of care seek/receive during the visit to the dental care provider including: preventative, routine, and emergency care.

Reasons to avoid visit to the dentist: Reason(s) patients cite for not visiting the dental care provider, even when it is needed. These include: did not need care, not important or a priority, no access to dental care/no dental insurance, and concerns/fear.

Self-perceived oral health status: The personal description of oral health from the participant's point of view.

Visits to the dentists: The number of visits taken by the participant seeking dental treatment during the last 12 months, regardless of the type of treatment.

Assumptions

I assumed that participant responses were honest. I also assumed that oral health literacy can be assessed by the REALD-30 instrument. In addition, I assumed that oral health literacy was correlated with general health literacy and oral health quality of life.

Limitations of Study

Limitations of this study included its lack of randomization, which limits the extrapolation of results to other populations. The REALD-30 and its Spanish version do not measure comprehension, only reading skills, and the nature of a cross-sectional design did not allow me to establish temporal associations among the variables under study. Another limitation associated with the study was that self-reported information may be subject to recall bias. Due to self-selection bias in a study with volunteer participants, frequencies in demographic variables may not reflect the population from which the sample was taken (see Panucci & Wilkins, 2010).

Scope and Delimitations of the Study

This study was delimited by the geographic area of the State of Texas and the Hispanic origin of the participants. This study was also delimited by the choice of tools to I used to collected data, and by the conceptual framework I used to select study variables.

Significance of the Study

In this study, I validated a Spanish version of an oral health literacy tool. This study is important because in it I addressed the possible complications cause by lack of dental care, and the possibilities of addressing them with proper intervention. The positive social changes that may result from this study and its conclusions include providing the dental profession and research community with an assessment tool for oral health literacy, thus allowing oral health professionals to understand the dynamics and challenges experienced by Hispanics regarding oral health literacy. This study also fills an existing gap in scholarly literature, and contributes to knowledge regarding best

practices for improving decision-making processes. In addition, educational and health promotion programs aimed at prevention and risk reduction of oral health disease and disparity will have a foundation to formulate protocols.

Furthermore, the study results will assist in the achievement of *Healthy People 2010 and 2020* objectives (Office of Disease Prevention and Health Promotion, 2001, 2012) by providing data that can be used in the creation of audience or language-specific materials at the adequate level of literacy required to be understood by this population. Moreover, by showing representative data from the target population, it will facilitate planning, implementation, and evaluation of future interventions.

Summary and Transition

Health literacy is an important component of health care, as oral health literacy is important in the achievement of good oral health. Low or marginal oral health literacy is associated with poor oral health status due to patients' inability to make the appropriate decisions, navigate the health care system, and communicate properly with the oral health care provider. Nearly 90 million American adults have limited health literacy and face risk of complications from existing medical conditions and poor medication adherence, as well as the increase of medical care expenses (Kirsch, Jungeblut, Jenkins, & Kolstad, 2002; Kutner, et al. 2004). In the oral care context, individuals face similar risks regarding their oral health, maintenance, and care.

Existing literature includes a paucity of research conducted with the Hispanic population in assessing oral health literacy levels, and does not have an appropriate tool for such research. I designed this study to validate a Spanish translation of an existing

tool for assessing oral health literacy in the Hispanic sector of the population. In this chapter, I provided an introduction to the study. In Chapter 2, I present a review of existing relevant literature, and Chapter 3 describes the methods that will be used for population sample selection, instruments, data collection, and analysis of the study. Chapter 4 and 5 present the results and analysis of the collected data, as well as the interpretation of these results, with a summary and conclusion of the study.

Chapter 2: Literature Review

Introduction

In this chapter, I discuss relevant literature on the topic of health literacy and its relationship with health outcomes, in general, and with oral health, in particular. I also addresses the health literacy tools available to assess literacy levels in the population, and the methodology available to translate existing tools utilizing a cross-cultural approach. In order to attain a comprehensive review of the existing literature on the subject of health and oral health literacy, I employed a systematic search strategy.

Literature Search Strategy

I searched for resources by category using bibliographic databases, including MEDLINE, PubMed, Cumulative Index to Nursing and Applied Health (CINALH), the Walden University library databases, the Center for Diseases Control and Prevention (CDC) library, and the National Institute of Dental and Craniofacial Research (NIDCR) library. I searched the databases were searched for primary sources such as peer-reviewed articles and abstracts. I also explored secondary sources to allow for discovery of evidence published elsewhere. In addition, I searched Internet sources such as Google Scholar and Yahoo. My list of search terms included: *literacy, health literacy, oral health literacy, health outcomes, literacy tools, translation methods, hispanics, oral health outcomes, oral health knowledge, oral health practices, and clinical recommendations*. The terms were combined using Boolean operators, such as AND, OR, and NOT.

During the reviews, I recorded details of the study design, including the type of study, the study description, methodology, sample characteristics, analysis plan, and results. In order to secure the most current literature, I first include only articles published in or after 2005. Thereafter, I included other articles if I determined that they were relevant to the development of the topic of discussion. I entered the findings into a table using the matrix method to allow for codification and classification of the studies by author(s), year of publication, type of publication, type of study, type of literacy tool utilized, participants, results of the study, and implications for the future.

Oral Health in America

In the year 2000, the Surgeon General released the *Oral Health in America* report, a portrait of the oral health of the U.S. population. This report, contributed to by many health professionals, showed the need to improve oral health care, and how factors such as economy, lack of insurance, and cultural and social status can impact the oral condition of the American population. The occurrence of oral diseases is not equally prevalent among all populations in the United States, and many individuals who suffer from oral disease are also affected by low or no income, limited or no access to care, or lack of insurance, and some belong to a minority group. Oral health status is affected by several components such as biological make-up, social and cultural disposition, and economics (Fischer-Owens et al., 2008). An individual's oral health is a reflection of the overall components of his or her life, and can be a factor in the outcome of his or her social and economic status and productivity in life.

The nation's oral health has shown a significant improvement compared to previous decades, yet oral diseases, especially caries, remain common in the United States (DHHS, 2000c). Oral Health care involves the care of the hard tissue (teeth, osseous structure), the soft tissue like the gingiva and oral mucosa, and supporting head and neck structures. The damages resulting from oral disease can be seen beyond the mouth. Oral disease affects nutrition and self-esteem, and can cause adverse effects on existing systemic illness. In children, it can also contribute to poor academic performance (CDC, 2009).

The CDC (2008) described the dental portrait of the young population of the United States as including tooth decay as one of the most common chronic diseases in childhood, five times as common as asthma and seven times as common as hay fever. Additionally, at least 50% of children aged 5 to 9 years old showed at least one cavity or tooth filling, while 78% of 17 year olds have experienced decay, and by this same age, more than 7% have lost at least one permanent tooth as a result of decay. Between the years 2001-2004, over 25% of the U.S. population between the ages of 20 and 64 had untreated dental caries. According to the National Institute of DentoCranial Research (NIDCR, 2002), 92% of adults 20 to 64 had dental caries in their permanent teeth.

Oral diseases have an effect on older adults who are economically disadvantaged, lack dental health insurance, and members of racial and ethnic minorities. Others characteristics found in the elderly population at risk for oral health conditions include being disabled, being in an institution, and not being able to leave the house (DHHS,

2000). Furthermore, nearly 30% of adults 65 years or older have lost their natural dentition, affecting food intake and nutrition (Oral Health America, 2003).

Severe periodontal (gum) disease affects about 14% of adults aged 45 to 54 years (CDC, 2006), and 30,000 people are diagnosed with mouth and throat cancer each year, causing 8,000 deaths and making mouth and throat cancers the sixth most common cancers in U.S. males, and the fourth most common in African American men.

According to the CDC (2009b), every year Americans make about 500 million visits to the dentist. Moreover, it is estimated that for the year 2010, about $108 billion was spent on dental services (Centers for Medicare & Medicaid Services, 2010). Furthermore, for any school year, approximately 51,679,100 hours are missed by school-aged children due to a dental problem or visit, with 117 hours missed per 100 children (NIDCR, 2002c, 2010). Documentation of overall expenses of dental care do not itemize expenditures by type of treatment for the U.S. population. This data is also not available for those who do not have insurance, or for undocumented immigrants, many of whom receive treatment through charity work and low-income clinics.

The Burden of Oral Disease in the Hispanic Population

As the proportion of minorities in the United States increases, there is also an increase in this population's oral health needs. Using data collected in national surveys done in the years 1988-1994 and 1999-2004, Tomar and Revees (2009) concluded that the prevalence of dental decay for Hispanic children between the ages 2 and 6 had increased from 18% to 24%, and remained significantly high, over 63%, for those ages 6-8. In addition, a 2005 survey performed in California collected data from over 20,000

children in Kindergarten and 3rd grade, and showed that over 70% of the Hispanic children screened had decay in some teeth, while 26% showed advanced decay process (Dental Health Foundation, 2006).

In New York, Hispanic children demonstrated a higher rate of decay and treatment needs when compared to their African-American peers (Okunseri, Badner, Kumar, & Cruz, 2002). This was, however, not the case in the study performed by Montero, Douglass, and Matheiu (2003), where there was no difference in enamel defects and caries presence for the two groups under study. The authors attributed the results to similarities in the socioeconomic status (SES) of the children.

The oral health of farmworkers' children has been assessed in several studies. The migrant farmworker population is 87% Hispanic (National Center for Farmworker Health, n.d), and the prevalence of Early Childhood Caries (ECC) found in this population is among the highest, regardless of the region in which the studies took place (Call, Entwistle, & Swanson, 1987; Chaffin, Pai, & Bagramian, 2003; Lukes & Simon, 2005).

Oral health among Hispanic adults, including Mexican-American, Puerto Rican, and Cuban-American, has been cataloged as poor in several studies (Ismail & Szpunar, 1990, Watson & Brown, 1995). According to the 1985-1986 National Health and Nutrition Examination Surveys (NHNES) data, the prevalence of dental disease, such as caries and periodontal disease, is higher for the Hispanic population (Watson & Brown, 1995) when compared to the White population. Studies have found that among the Hispanic subgroups, Mexican-Americans demonstrate the highest decay prevalence, and

Puerto Ricans and Cuban Americans have the highest rate of tooth lost (Ismail & Spunzar, 1990). In addition, the most recent report on women's health stated that over 50% of Mexican-American women, and as much as 40% of women from other Hispanic subgroups, self-reported their oral health status as poor (USDHHS, 2011).

The status of oral health in Hispanics has been linked to factors such as lack of knowledge, language, SES, and cultural beliefs (Luciano, Overman, Frasier, & Platin, 2008; Vazquez & Swan, 2003; Watson, Horowitz, Garcia, & Canto, 2007). Watson, Horowitz, Garcia, and Canto (2007) found that the level of knowledge, opinions, and practices (KOP) for the Hispanic community was considerably low, with less than 10% having knowledge about the purpose of dental sealants, and only about 50% understanding the purpose of fluoride. In this study, nearly 25% of the children examined showed immediate need for dental care, and only 9% the parents were able to identify tooth brushing as a preventive measure for decay. Data from the NHNES 1985-1986 (Watson & Brown, 1995) and most recently from Luciano et al. (2008) showed that a majority of Hispanic adults reported perceived dental needs, and although the rate of perceived dental needs is high, the rate of visits to a dental provider is comparatively low. Among the barriers cited for deferring treatment were cost and time (Lombardi, 2001), limited clinic hours (Lukes & Miller, 2002), and language and cultural differences between patient and providers (Watson & Brown, 1995).

State of Texas Oral Health Statistics

In the State of Texas, a significant number of children and adults lack an established dental home (TDA, 2008). The most recent data from the National Survey of

Children's Health (NSCH, 2007) showed that over 25% of Texan children did not have a preventive dental visit on the year previous to the survey. Furthermore, 28% of children between 1 and 17 years old were reported as having one or more of the four oral health problems asked about in the survey: toothaches, decayed teeth/cavities, broken teeth, and/or bleeding gums. Fourteen percent of interviewed parents also rated the childrens' health as poor or fair (NSCH, 2007). Furthermore, 73% of children in the 3rd grade experienced tooth decay in the year 2007 (CDC, 2010c).

The Behavioral Risk Factor Surveillance System (BRFSS), a national survey of health conducted by the CDC (2010a), reported that only 61% of adults in Texas visited a dentist, compared to an average of 69% of the total national population in the year 2010. In addition, this same survey indicated that 59.9% of the Texan adults had a cleaning done by a professional dental care provider. An average of 43% adults reported having at least one tooth extracted for the year 2008, and 14% of the adults over 65 years old had all teeth extracted (CDC, 2010a).

Data from the BRFSS for the year 2010 revealed that 63.7% of females in Texas visited the dentist, compared to a national average of 71.1% (CDC, 2010a). In addition, the Texas Pregnancy Risk Assessment Monitoring System (PRAMS) reported that nearly 70% of women did not see a dentist during pregnancy, with 24% of them reporting having need of dental care (Kinsgley & Martin, 2008). Of this group, less than half went for care. The highest rate of absence of dental care was among Black (70.3%) and Hispanic (76.2%) women. Characteristics of the women who did not receive dental care during the pregnancy included: an annual household income of less than $50,000 per

year, low educational levels (less than high school), and those under the coverage of government insurance.

The statistics on cancer revealed that, in Texas, oral cancer is highest among African-American males, with a rate of 7.5 per 100,000 persons, compared to 4.9 among white males and 3.2 among Hispanic males. Furthermore, a report from the Texas Cancer Registry showed that of all expected cases of cancer to be diagnosed for the year 2011, about 3% will be on the oral cavity and pharynx (Risser, 2011).

The report *Oral Health in Texas* from 2008 (TDHHS, 2008) showed that Texas has not yet met the targets for objectives proposed in *Healthy People 2010*. Among them are a decrease in the rate of dental decay for children ages 2-6 and 6-8, and an increase in the utilization of sealants for permanent teeth in children 8 years old and over, as well as an increase of dental care for underserved populations. According to the Center for Health Statistics (Texas DHSH, 2008), for the year 2007, there were 8,671 dentists active in private practice in the State of Texas. The highest concentration of dental providers was seen in the metropolitan areas with a ratio of 38.5 per 100,000 population, while the concentration for the non-metropolitan areas was 23.5 for 100,000. This distribution creates a gap between available dental care resources and the reported need by those living in rural counties, thus increasing the burden of oral diseases on Texas residents.

Risks Factors to Poor Oral Health Outcomes

Risk factors are those aspects of a person's lifestyle, constitution, heredity, or environment that may increase the chances of developing a certain disease or condition. According to the WHO Oral Report (2003), oral health has risks factors common to other

disease, such as cardiovascular diseases, diabetes, cancer, and chronic obstructive and pulmonary disease.

Among these factors are those related to lifestyles, such as dietary habits, hygiene, and the use of tobacco and alcohol. Habits such as flossing, brushing, and healthy eating are proven to help fight the presence of decay and periodontal disease. Furthermore, the association between consumption of sugar-rich foods and frequency of sugar intake with caries development has been established by numerous studies, including interventional, cross-sectional, and longitudinal research (Dye et al., 2004; Lim et al., 2008; Moynihan & Petersen, 2004).

Studies show a strong association of cigarette smoking and chewing tobacco to the risk of periodontal disease, oral cancer, and congenital defects (Chlebovec, Montelpare & Pynn, 2008; Petersen, 2003). There is evidence of the relationship of periodontal disease and tooth loss to general chronic diseases, such as diabetes mellitus (Campus, G., Salem, A., Uzzau, S., Baldoni, E., & Tonolo., 2005; Taylor, 2001) and cardiovascular diseases (Genco, Offenbacher, & Beck, 2002).

Other risks of oral disease are related to sociocultural determinants, such as living conditions, education level, and cultural beliefs (WHO, 2003). Differences in living conditions based on socioenomical status (SES) have an effect over prevalence of dental decay. According to the Surgeon General Report (2000), poor children and adults suffer from more severe decay and other oral health conditions than those with better SES. Furthermore, the report showed differences in oral health status by race/ethnicity, stating

that poor Mexican-American children demonstrate the highest rate of untreated decayed teeth when compared to their peers of other races.

Education plays an important role in the preservation of oral health. Reports of studies done among the US population (USDHHS, 2000; Vazquez & Swan, 2003) revealed that adults over 25 with less than a high school education visit a dental provider less than those with a higher educational level. When used as a component to estimate SES, those individuals with low educational attainment were more likely to have more unmet dental needs. In addition, in a preliminary report of an ongoing study at the time, Hobdell et al. (2003) reported an association between the occurrence of caries, periodontal disease, and oral cancer and the SES of the participants. Mounting evidence of the effects of socioeconomic status on oral health could explain some of the noted differences in oral health outcomes among the population. Still, there are other determinants that have an effect over the oral health status.

Environmental risk factors mentioned in the literature as related to oral disease include access to fluoridated water and available oral health care, geographic and transportation barriers, an acute shortage of dental professionals in rural areas, and lower rate of reimbursement from dental insurance policies. The benefit of fluoride on the prevention of caries is documented in academic literature. In a five-year longitudinal study, the results showed that patients with access to fluoridated water had fewer dental restorations and lower dental care costs than those living in non-flouridated communities (Maupomé, Gullion, Peters, & Little, 2007).

Government programs, such as Medicaid and CHIP, offer dental care services to low-income patients. Even though these programs exist, participants have reduced access to dental care, in some cases due to a shortage of practitioners as a result of low reimbursement for participating dentists (Decker, 2011). Searching for providers, arranging an appointment where choices were severely limited, and finding transportation were cited among the perceived barriers by caregivers in search for dental care for their children (Modified, Rozier, & King, 2002). Studies performed among farmworkers' families suggested that access to services, not lack of education, is the primary barrier facing these families when in need of dental care (Quandt, Clark, Rao, & Arcury, 2007). Other programs that cover medical care for the elderly, such as Medicare (in which coverage is based on individual states policies), might not include routine dental care coverage. This limitation, paired with difficulties in mobility, impedes access to oral health care in this population—especially for those who live in remote areas where public transport is scarce (Dolan, Atchison, & Huynh, 2005).

Misconceptions, incorrect knowledge, and attitudes about oral health, dental care, and behavior might act as barriers preventing the acquisition of prompt and preventive dental care. Health literacy has been proposed as a 'silent barrier' to the proper use of dental services (Horowitz & Kleinman, (2008), especially in the presence of other risk factors that combine to create a negative effect on health outcomes (NIDCR, 2005). Oral health literacy is defined as "the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate oral health decisions" (DHHS, 2000a, Chap. 21, p.39), and its importance to the health

status of the American population has been portrayed in *Healthy People 2010* (DHHS, 2000), and *Healthy People 2020* (DHHS, 2011), *Oral Health America: A Report of the Surgeon General* (2000), and in *Heath Literacy: A Prescription to End Confusion* (IOM, 2004). Furthermore, oral health literacy has been associated to dental knowledge, lack of dental care, self-reported poor or fair perceived dental status, and unhealthy behaviors (Jones, Lee, Rozier, 2007; Parker & Jamieson, 2010).

Literacy and Health literacy

Literacy as defined by the National Center of Education Statistics (NCES, 2009) "is the ability to use printed and written information to function in society, to achieve one's goals, and to develop one's knowledge and potential" (Baer, Kutner, & Sabatini, 2009, p.3). In the year 2003, the NCES conducted the National Assessment of Adult Literacy (NAAL) in the United State population. Over 19,000 adults above the age of 16 participated at national and state level, representing the entire population of the United States and included inmates of correctional facilities. The assessment included three literacy scales: prose literacy, document literacy, and quantitative literacy, and was based on a common daily tasks framework. Each participant received a socio-demographic questionnaire and a booklet of questions and stimulus material separated by tasks. (NCES, 2003) (Figure 4).
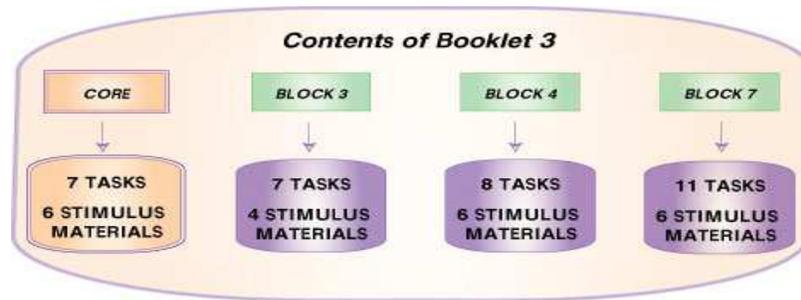
Figure 4. Assessment Booklets. Adapted from: *National Assessment of Adult Literacy (NAAL)* (2003). U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 1992 National Adult Literacy Survey and 2003 National Assessment of Adult Literacy. Copyright 2003. https://nces.ed.gov/naal/si_booklets.asp

Prose literacy is the ability and skills needed to comprehend, analyze, and search for information in written materials. Document literacy is the capacity and knowledge to use non-continuous documents, such as job applications, maps, and tables. Finally, quantitative literacy (or numeracy) is the necessary skill to perform computational tasks using information on printed materials, such as determining dosage of medication to be administered from a printed label (Baer et al., 2009; Kutner et al., 2006; Lo, Sharif, & Ozuah, 2006).

The results of the 2003 NAAL (Figure 5) indicated that nearly 20% of adults were Below Basic in quantitative literacy, 14% of the surveyed were Below Basic in prose literacy, and 12% were Below Basic in document literacy (Kutner et al., 2007). The reports based on the NAAL confirmed that nearly 90 million of Americans demonstrate limited levels of literacy, of which 11 million adults could not read or answer a simple test questionnaire, and/or could not answer the test due to linguistic barriers (Baer et al., 2009; Kutner et al., 2007). The limitation that this sector of the population faces is identified as 'low and marginal literacy.'
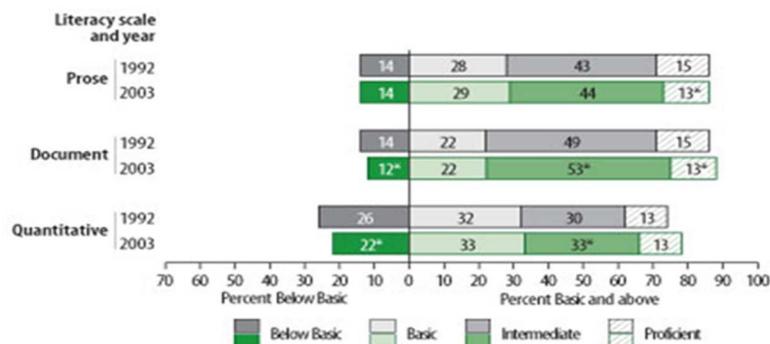
Figure 5. Average prose, document and quantitative literacy scores of adults: 1992 and 2003. Adapted from: *A First Look at the Literacy of America's Adults in the 21st Century* by Kutner, M., Greenberg, E. and Baer, J., 2006, p.12. Copyright 2006. U.S. Department of Education.
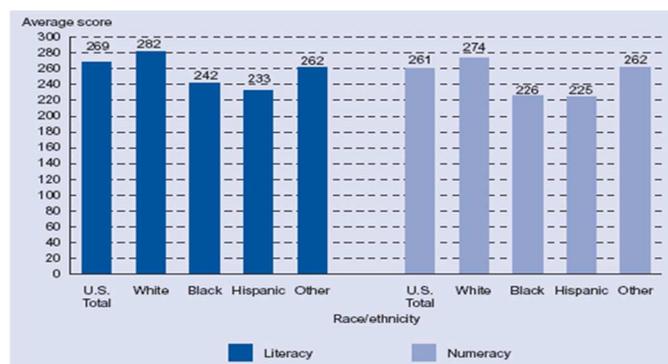
Figure 6. Average literacy and numeracy scores of U.S. 16- to 65-year-olds, by race/ethnicity: 2005. Adapted from: *Highlights From the 2003 International Adult Literacy and Lifeskills Survey (ALL)* by M. Lemke, D. Miller, J. Johnston, T. Krenzke, L. Alvarez-Rojas, D. Kastberg, and L. J., Westat 2005, p.12. Copyright 2005. U.S. Department of Education.

Furthermore, according to the NCES, compared to other races, Hispanics have the lowest

scores in general literacy and numeracy (Figure 6). Further, when measuring and

comparing literacy by gender, women scored higher than men on prose and document

literacy, while men did better than women on quantitative literacy.

In addition, the results showed that literacy is related to educational attainment in

all three types of literacy (Figure 7). According to a 2007 report (Kutner et al.), an

increase in the level of educational degree obtained by the participant demonstrated a

higher literacy level in the individual, especially if their first language is English.

Furthermore, over 60% of U.S. adult citizens demonstrate low or inadequate literacy

skills, and about 50% of Hispanics and 40% of African-Americans show reading

problems.
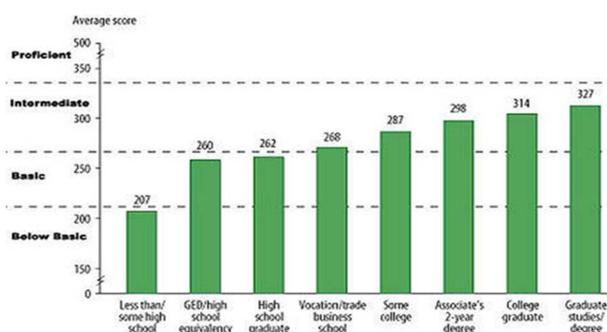
Figure 7. Prose literacy by educational attainment: 2003. Adapted from: *National Assessment of Adult Literacy (NAAL)* (2003). U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 1992 National Adult Literacy Survey and 2003 National Assessment of Adult Literacy. Copyright 2003. https://nces.ed.gov/naal/kf_dem_edu.asp

In the year 2000, the United States Department of Human and Health Services (DHHS) disclosed the *Healthy People 2010* objectives, and in 2010, a revision of the objectives to improve people's health was released as *Healthy People 2020*. Among the objectives listed were the need to improve overall health, to address health disparities, and to improve health communication among the most affected populations, people who lack access to care due to cultural or spiritual differences. In order to achieve this task, general literacy and specific health literacy need to be addressed.

According to the World Health Organization (WHO, 1998, p.10), "health literacy represents the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health." In addition, health literacy was described as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Selden et al, 2000; DHHS, 2000a). According to a systematic review performed in 2005 by several authors, health literacy is a construct related to age, educational attainment, reading capacity and comprehension, visual and auditory acuity, race, and gender (Paasche-Orlow, Parker, Gazmaranian, Nielsen-Bohlman, & Rudd, 2005a; Williams et al., 1995). The concept of health literacy encompasses the skills to read, comprehend, analyze, and process terms and medical information, and the skill to act on received information and follow instructions in order to make appropriate and assertive decisions about health and medical treatment (Kutner, et al, 2004).

Basic literacy skills, as well as health information knowledge, are required in order to have adequate health literacy. Health information and the healthcare system can be overwhelming in the absence of this knowledge, and it could be difficult even to those with advanced literacy skills. The health information comes from different sources, including, but not limited to, friends and family, the media, websites, and health care professionals. Since the information comes from different sources, it may communicate different messages, making it more difficult for those whose level of literacy is not adequate.

Health literacy affects individuals from all socioeconomic, educational, and ethnic backgrounds. It is dependent on individual and systemic factors, such as culture, beliefs, religion, exposure to the health field, communication skills of lay persons and health care field professional, knowledge of medical background, influences and requirements of the healthcare and public health systems, and situational settings (Nielsen-Bohlman, Panzer, & Kindig, 2004). It affects people's capacity to navigate through the healthcare system, disclose personal information that might be significant to health management and self-management of chronic-disease, and understanding concepts such as consent, risk of procedures, and possible complications.

Studies concluded that 15% of individuals with literacy problems will never tell anyone that they cannot read, 85% will hide it from their coworkers and nearly 70% will never admit to their spouse their lack of reading skills (Parikh, Parker, Nurss, Baker, & Williams, 1996). Patients with low health literacy frequently use coping mechanisms to avoid revealing their lack of reading skills, such as bringing along a family member to

help with the reading, making excuses (such as mentioning they forgot their glasses at home), watching and imitating others, and asking staff or other patients for help (Parikh et al.,1996). As a result, these individuals will have problems communicating with their health care provider, and their struggle might be invisible to others.

The previous statements present a challenge for the United States public health system in achieving the goals set out by the *Healthy People 2010* and 2020 objectives of improving the health literacy levels of the U.S. population. It also illustrates the reality of how the people in the United States live regarding the improvement of their quality of life, access to care, and overcoming health disparities.

Health Literacy, Oral Health Literacy, Knowledge and Outcomes

Researchers have explored the relationship of health literacy with Diabetes, Asthma, Cancer, Cardiovascular diseases, and other health conditions. According to the results of the NAAL (n.d), 75% of those who reported a chronic medical condition had low health literacy preventing them from effectively managing their condition. Some of these results are discussed in this section.

Diabetes Mellitus is a chronic condition that was ranked the 7th cause of morbidity, and affects 23.6 million children and adults or 7.8% of the population living in the United States (American Diabetes Association, 2007). This illness can lead to devastating complications if not properly managed. Among those affected, 6.6% are non-Hispanic whites, 7.5% are Asian Americans, 11.8% are non-Hispanic blacks and 10.4% are Hispanic (ADA, 2010). Powell, Hill, and Clancy (2007) presented a study on 68 diabetes patients who were tested on literacy levels, Diabetes knowledge, and beliefs

using the REALM, the Diabetes Knowledge Test (DKT), and the Health Belief Model

scale, respectively. The results of this study showed, after adjusting for covariates and

confounders, that low literacy level has no correlation with the participant's performance

in condition management. Furthermore, concurrently with the existing literature, low

literacy was related to lower scores in the DKT, and higher hemoglobin A1C than those

with higher literacy levels. Other studies on the subject have attempted to identify the

relationship between health literacy and glycemic control, self-efficacy, and trust. Among

these, De Walt, Boone, & Pignone (2007) found that health literacy was not directly

associated to glycemic control, self-efficacy, and trust in the physician or patient

involvement in the management of the condition. A more recent study performed by

Mancuso (2010) on health literacy and glycemic control found similar results. Contrary

to the results of Powell, Hill and Clancy (2007), Mancuso (2010) came to the conclusion

that, although literacy levels are related to diabetes knowledge and patient's condition

management, it was less associated to glycemic control in the study population. As health

literacy has been linked to Diabetes, several authors established its connection with

asthma management.

Asthma is another chronic condition with a high prevalence in the United States,

which affects the respiratory system of both adults and children. According to a report

from the Centers of Disease Control and Prevention (Akinbami, Moorman, & Liu, 2011)

there are 24.6 million sufferers of this condition in the United States. Among those, 7.1

million are children. Asthma is the cause for 13.3 million visits to physicians, hospital

outpatient clinics, and emergency room departments, as well as the cause for 13 million

missed schools days (American Lung Association, 2010). The management of this chronic health condition is multi-factorial and comprehensive, with the involvement of medications and exercise, as well as household and environmental control of triggering factors. The patient, as well as the caregiver, needs to understand the actions that could potentially compromise and/or control the symptoms and frequency of asthmatic episodes.

Shone, Conn, Sanders, et al. (2009) studied 499 parents of asthmatic children to determine the role of Health literacy in the manifestations of asthma. Nearly a third of the participants scored at low literacy levels, and health literacy was found independently associated with a higher perception of sickness, worse burden, and poor self-reported quality of life. The study also showed that those scoring lowest in health literacy were parents in the non-white, Hispanic, or non-employed groups. Mancuso and Rincon (2006) in their longitudinal study measured "the association between health literacy and asthma outcomes and how literacy affects outcomes through covariates" (p.813). With a population of 175 adult asthma patients, the authors established a direct association between health literacy and poorer quality of life, inferior physical function, and more emergency visits, while it maintained an indirect relationship between poor longitudinal asthma outcomes through knowledge of asthma management (Mancuso & Rincon, 2006). Paasche-Orlow et al., (2005b) in their study about asthma and its relationship between inadequate health literacy and difficulties learning and retaining instructions about discharge medications and appropriate MDI technique, observed that the "deficiencies in asthma self-management skills could not be explained by socio-demographic

characteristics (age, sex, ethnicity, and education) or past asthma-related health care use but were independently associated with inadequate health literacy" (p.983).

The relationship of health literacy to other conditions, such as glaucoma, COPD, mental illness, HIV/AIDS and treatment compliance with doctor's instructions and medications intake has been studied as well by several researchers. In the study performed by Juzych et al. (2008), the authors worked on establishing the association between health literacy and "compliance, disease awareness, and disease progression in patients with glaucoma" (p.719). The study utilized 204 participants, and assessed health literacy using the TOFHLA. The researchers concluded that half the participants (102) had poor health literacy. Among these participants, the results showed less compliance with treatment, exacerbated visual fields when evaluated in subsequent visits, and less understanding of the condition of glaucoma (Juzych et al., 2008) than their counterparts with higher literacy scores.

In assessing the influence of health literacy over health outcomes in HIV/AIDS patients, Nokes et al. (2007) used the REALM instrument. The study concluded that the participants of the study who experienced or reported more changes, distress related to the disease, more depressive symptoms, and an intensity of HIV symptoms were those with higher health literacy scores. Those reporting poorer health outcomes were also characterized by being Hispanic (Nokes et al., 2007). The results of this study contrast those of Kalicman and Rompa (2000), who reported on low literacy being related to poorer understanding of medically related instructions, poorer medications adherence, and a lower count on defensive cells (CDT4), thus a higher risk of hospitalizations.

Mental illness, specifically depression, was found to be associated with low health literacy levels in patients with alcohol and drug dependence (Lincoln et al., 2006). In the prospective cohort analysis of the HELP study, those patients who experienced more severe depressive symptoms were those who presented low literacy levels according to the REALM. Gazmararian et al. (2000) had studied the relation of depressive symptoms in the elderly population and its association with literacy levels, concluding that those patients who reported more depressive symptoms were those who scored lower in literacy level and who had the poorest health outcomes. The relationship between health literacy and health outcomes has been established by several studies, and explained by the influence of other factors, such as inadequate medication use and difficulty in reading prescription labels.

Health literacy levels have been linked to the misunderstanding and failure of compliance in the use of medications (Davis et al., 2006) in adults and in parents, as they are required to administer medication to their children (Lokker et al. 2009; Yin, Dreyer, Foltin, Vanschaick, & Mendelsohn, 2007). Torres and Marks (2009) evaluated the relationship of Health literacy and hormonal replacement therapy, self-efficacy, and decision making in a group of 106 female participants between the ages of 45 and 65. The results established a positive correlation between the variables of health literacy and knowledge about hormonal therapy, health literacy, treatment decision, and self-efficacy.

Studies that include Hispanic participants indicated that, in this sector of the population, low literacy was associated with negative asthma outcomes (Mancuso & Rincon, 2006). This population is less likely to be screened for the presence of diseases

(Garbers & Chaisson, 2004; Guerra, Krumbloz, & Shea, 2007; Guerra, Dominguez and Shea, 2005), and is less likely to understand a prescription label (Lo, Sharif, & Ozuah, 2006), particularly when compared to English-speaking Hispanic patients (Aguirre, Ebrahim & Shea, 2005). Guerra, Krumholz and Shea (2005) researched literacy and knowledge, attitude, and behavior regarding mammography in Latinas. The cross-sectional study performed utilized a convenience sample of 97 participants, and examined the influence of functional health literacy and knowledge, beliefs, attitudes, and behavior over the acquisition of the preventive screenings, such as mammography and breast self-examination (Guerra, Krumholz, & Shea, 2005). The authors utilized the S-TOFHLA to assess the literacy levels of the participants. The results of this study revealed that Latinas with a marginal or low level of literacy were less likely to seek a mammogram, and inversely, high literacy levels were associated with higher frequency of mammography and knowledge about frequency required for this test.

Garbers and Chiasson (2004) researched the "association between inadequate functional health literacy in Spanish-speakers among low-income Latinas aged 40 and older and cervical cancer screening knowledge and behavior" (Garbers & Chiasson, 2004, p.1). This study was performed with the participation of 205 Latinas of various nationalities, and utilized the Spanish version of the TOFHLA. The authors concluded that approximately 50% of the population under study had difficulty interpreting written medical materials, even in their native language (Spanish), and after controlling for other factors, such as age, educational level, having a source of care, having health insurance,

and years in the United States, this population had a lower rate of receiving a Pap Smear test.

Oral Health knowledge, attitudes, perceptions, and practices are factors that might be affecting access and utilization of dental services. Parker and Jamieson (2010) studied the association between oral health literacy and oral health outcomes, as well as the role it plays in self-reported oral health status among indigenous Australians. The study recruited 468 subjects to participate in the study, who were tested with the REALD-30 and completed a self-report questionnaire on perceived oral health status and socio-demographic characteristics. The authors evaluated dependent and independent variables to establish a correlation between dental utilization, oral health knowledge, behavior, and oral health outcomes and literacy. After adjusting for cofounders and acknowledging study limitations, Parker and Jamieson (2010) concluded that the subjects of this study that demonstrated low oral health literacy, as measured by the REALD-30, also demonstrated inadequate oral health knowledge and more harmful oral health literacy-related behaviors.

Jones, Lee, and Rozier (2007) assessed oral health literacy in the dental private sector to examine the association of dental knowledge, dental visits, and oral health status with oral health literacy. The study was a cross-sectional design, with 101 patients at two urban dental clinics, who completed the REALD-30 as well as a socio-demographic survey. For the purpose of the study, the authors defined low literacy as obtaining scores on the REALD-30 of less than 22 correct answers out of a total of 30 answers. The results of the study determined that those participants showing incorrect dental care knowledge

had made no dental care visits in the year previous to the study, reported having fair or poor oral health, and were around three times more likely to score in the lowest levels of literacy (Jones, Lee, & Rozier, 2007).

As expressed by authors Georges, Bolton and Bennett, (2004), research performed in multiple settings has come to the conclusion that there is a strong correlation between low literacy and poor health outcomes. Low literacy may also interfere with a patient's capacity to read and understand medication administration, as well as the ability to interact actively with their physician or health care provider, therefore settling for suboptimal healthcare.

<div align="center">

Health Literacy and Oral Health Literacy Assessment

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Health literacy assessment tools. Several instruments have been built to assess literacy in English and Spanish speaking populations. The available instruments can measure reading skills, and some have the ability to measure comprehension in addition to reading capacity, utilizing a list of words or paragraphs that contain medical and health information. Among the existing tools, there is the test of functional health literacy in adults (TOHFLA), the rapid estimate of adult language in medicine (REALM), a word recognition and pronunciation skills test, and the wide range achievement test-revised (WRAT-R) (which is not specific for medicine although it can measure arithmetic, spelling, and reading skills), and the Newest Vital Sign (NVS), which assesses general literacy and numeracy skills as they are applied to health information.

The REALM was initially developed as a brief tool to assess reading levels in the clinical setting (Davis, et al. (1991). This test is capable of screening patients' reading

skills, and helps to determine literacy levels when the results are compared to preset grade levels. The REALM consists of a list of 66 medical terms, which are read out loud by the participant. One point is allocated for each correctly pronounced word, serving as the basis for establishing the participant's literacy level. This test does not measure comprehension or understanding of the meaning of the pronounced words. The scores range from 0 to 66; with a 0-44 score translated to below the 6th grade reading level, 45-60 indicating reading levels of 7th or 8th grade, and scores higher than 60 are equivalent to high school or higher levels of education. In the validation study of the original REALM version, performed by Davis, et al. (1991), the test was administered to a convenience sample of 207 adults simultaneously with three other reading tests to determine its comparability to existing reading measurement tools. The REALM performance was well-established by a test-retest reliability of 0.98, inter rater reliability of 0.99, and a high correlation between this test and established tests used for comparison: the Slosson Oral Reading Test (SORT) and the Peabody Individual Achievement Test (PIAT-R). Several versions of this test have been developed to assess health literacy in special populations, including the REALM-Teen (Davis et al., 2006b), a shortened version which uses fewer words (REALM-R) (Bass, Wilson, & Griffith, 2003) (for use when the time is limited), and those modified to accommodate the needs of dental professionals (REALD-99) (REALD-66). Although a commonly used tool, the REALM is not the only tool available to researchers for measuring health literacy.

The TOFHLA has been widely used by various authors in their journey to determine how literary levels can impact health outcomes (Anderson, 1971; Parker,

Baker, Williams, & Nurss, 1995; DeWalt & Hink, 2009; Schillinger et al., 2002). Based

on the cloze system, where words within a passage are replaced by blank spaces

(Anderson, 1971), the TOFHLA consists of two parts and measures reading and

comprehension. The first part is a multiple choice selection assessment, where numerical

skills are established. The participants are presented with medication labels, and are then

asked to answer questions about how, when, and how frequently the medications are

supposed to be taken. The second part consists of the comprehension assessment, where

the participants are presented with three passages containing information about

preoperative procedures, medical insurance coverage, and informed consent forms. The

passages contain blank spaces to be filled with a selection of possible words by the

participant. This instrument has been tested for validation and correlation (Parker, Baker,

Williams, & Nurss, 1995). The study estimated the correlation between the TOFHLA and

the existing validated tests, the REALM and the WRAT, to be 0.74 and 0.84,

respectively. In another study performed by Georges, Bolton and Bennett (2004), the

TOFHLA showed a Cronbach's Alpha of 0.95 for their sample population of Hispanics

and African-Americans and a 0.98 on their Reading Comprehension component, making

it a valid tool to assess literacy levels in varied populations. The TOFHLA is available in

its short version (S-TOFHLA), which contains only four multiple-choice numeracy

questions and two reading passages, and was validated by Baker et al., (1999). A Spanish

version was validated by Aguirre, Ebrahim, and Shea in 2005. The Newest Vital Sign

test, which is available in English and Spanish, can be completed by participants in nearly

three minutes, which facilitates the administration of a health literacy tool in real life

medical practice. The participants are presented with a copy of a nutritional label, and then asked to respond to six questions regarding the content of the label, such as caloric input and portion size. The responses are coded incorrect or correct and translated to literacy levels. Scores of 4 to 6 out of 6 responses classify the participant as having adequate health literacy levels, scores 2 to 4 are translated as 'possibly' having low health literacy levels, and 0 to 2 points placed the person as 'likely' to have low literacy levels. Weiss, et al. (2005) tested the final version of the NVS, and the study was modeled using several options of possible tests that could have been used for this purpose. The test achieved an internal consistency of 0.69 on the Cronbach's scale and a Pearson correlation with the TOFHLA of 0.49. The authors concluded that the NVS was a good alternative to assess patients' health literacy levels at a practical level, due to the short time required to administer it (about three minutes), its good reliability and correlation with the TOFHLA, and the fact that it is available in Spanish.

Searching for alternative tools that can address the needs to establish health literacy levels in the population, other authors have developed several other tools, such as the Single Item Literacy Screener (SILS) by Morris, McLean, Chew, et al. (2006) and the SAHLSA (Short Assessment of Health literacy for Spanish-speaking Adults), which is based on the REALM with an additional comprehension section (Lee, Bender, Ruiz, & Cho, 2006). Chew, Bradley and Boyko (2004) created screening questions that determined, with the use of a 5-point Likert-scale, which questions were more adequate to assess literacy levels. This produced a set of three questions that would help determine patients' health literacy in the clinical setting, allowing for an initial assessment when

there are time limitations. The need to establish literacy levels in other fields has lead

researchers to adjust existing tools or create new ones to serve this purpose.

Oral Health Literacy and Assessment.

Based on previously constructed literacy assessment tests, such as the REALM

and the TOFHLA, some researchers have created tools to assess Oral health literacy

levels in the population. Among the different tools available to test oral health literacy are

the Test of Functional Health literacy in Dentistry (TOFHLiD), the Oral Health Literacy

Instrument (OHLI), the Rapid Estimate of Adult Literacy in Dentistry-30 (REALD-30), a

longer version (REALD-99), and the Rapid Estimate of Adult Literacy for Medicine and

Dental (REALM-D). Similar to the original test, the REALM, the REALD-30 and

REALD-99 each consist of a list of dental terms to be read out loud by the participants, to

verify ability to read and pronounce the term. (Lee, Rozier, Lee, Bender, & Ruiz, 2007).

One point is awarded for each correctly pronounced word, and level of literacy is

established based on the number of correctly pronounced terms. The REALD-30 (Lee,

Rozier, Lee, Bender, & Ruiz, 2007) was tested in 202 participants, yielding an internal

validity of 0.87 on a Cronbach's alpha scale and correlation of 0.86 when compared to its

original test, the REALM. Even though the validity of the REALD-30 has been proven,

researchers Richman et al. (2007) constructed the REALD-99 and tested it in 102

participants. This test showed a positive Pearson's correlation of 0.80 with the original

REALM, a coefficient of 0.61 with self-perceived oral health status, and Pearson's

correlation of 0.73 with the established Oral Health Impact Profile-14 (OHIP-14), a test

that measures oral health-related quality of life. The authors concluded that the test was

reliable, but more research was necessary to adjust its results to specific oral health instruction compliance and behavioral outcomes. In a recent study (Divaris, Lee, Baker, & Vann, 2011), this assessment was used to determine the relationship between oral health literacy and oral health related quality of life (OHRQoL), a measurement of how oral health affects quality of life. Using a coefficient model, the authors found an association between low oral health literacy and the report of higher severity on the impact of oral health in the quality of life from the participants.

The Test of Functional Health literacy in Dentistry (TOFHLiD) is a tool that consists of a 68-item reading comprehension section and a 12-item numeracy section created by Gong et al. (2007). The tool consists of a reading comprehension section, a set of instructions about fluoride varnish applications, a consent form for dental treatment and a Medicaid Rights and Responsibilities form, a numeracy section with questions on instructions for fluoridated toothpaste use, a pediatric dental appointment, and prescription labels for fluoride drops and fluoride tablets. Validity of the TOFHLiD was established when the test produced a low internal reliability but a strong convergent validity to the REALD-99 scores. The results also showed a moderate ability to discriminate between dental and medical literacy—although its predictive validity was only partially established because correlation coefficients between these two tests, the TOFHLid and the TOFHLA, and the REALM were 0.52 and 0.53, respectively. The TOFHLiD scores were positively associated with oral health related quality of life, but its association with self-perceived oral health status of participant's parents and their children was not completely established. Although the authors felt confident in the results

of the tool, they advised more research be done before it could be used in a large

population study.

The Oral Health Literacy Instrument (OHLI) was created after the TOFHLA as

well, (Sabbahi, Lawrence, Limeback et al, 2009), like the TOFHLAiD with the inclusion

of dental terms into two paragraphs, utilizing the cloze system to evaluate Oral health

literacy in the population. Sabbahi, Lawrence, Limeback et al. (2009) studied the validity

and reliability of this instrument in 100 participants, achieving reliability of over 0.70 and

a Pearson's correlation with the original TOFHLA of 0.61 and a correlation of 0.573 with

the oral health knowledge test. It is the conclusion of the authors that this tool is valid and

reliable in the assessment of oral health literacy.

Another assessment tool was recently developed by Atchinson, Gironda, Messadi

et al. (2010), combining medical and dental terms in one test named the REALM-D. This

tool was based on the original REALM, and was labeled by the authors as a 'strictly

screening tool', and as per the authors description this tool does not have the ability to

evaluate patients' skills in understanding or comprehending the meaning of medical or

dental terms (Atchinson, Gironda, Messadi et al., 2010). For the validation of this test,

the authors used 200 participants, and it achieved reliability of a Cronbach's alpha of

0.958 and a Pearson's correlation of 0.99 with its original test, the REALM. The test

consists of three word-lists increasing in reading difficulty, where accurate pronunciation

is required. The words that are accurately pronounced are given a plus (+) score and a

point, and mispronounced words receive a minus (-) score. Those passed by the reader

are given 0 points, and the test results in a maximum score of 86 points. The results of

this study lead to the conclusion that non-white participants had lower scores than white participants, and subjects who reported English as their primary language scored higher on the literacy test. Another conclusion from this study was that levels of education significantly impacted the scores, as those with a higher level of education demonstrated higher levels of Oral health literacy. When the scores of the participants for the REALM-D were correlated to questions about confidence in filling out medical forms and the need of help reading hospital materials, those who reported having more confidence and not requiring assistance had the higher scores in the literacy test.

Of the available tools to assess oral health literacy, the REALD-30 is the most convenient, as it only takes a few minutes to administer it and collect the results. This characteristic allows the dental practitioner to identify those patients with low dental literacy levels, addressing their needs in the moment.

The importance of oral health has been linked to other health issues, such as diabetes, heart disease, respiratory disease, and pregnancy outcomes. Health literacy of the general population is not adequate, and the Hispanic immigrant population is faced with a great challenge when it comes to finding adequate health and dental care because of language barriers and financial issues. After the review of existing literature concerning health literacy and oral health literacy tools and oral health in the Hispanic population, it can be established that there is not an existing validated tool that could help determine oral health literacy levels in the Hispanic population. Moreover, even with the increase in the Hispanic population and the reports of existing language barriers for this

population, there is not an abundance of studies with the information correlating the relation of oral health literacy and dental care in the Hispanic population.

Conceptual Framework: Influences on Health Literacy

Based on the previous definition of health literacy (Selden et al, 2000; DHHS, 2000a), the appointed committee on Health literacy, in charge of documenting and describing the reality of health literacy in America, understood an individual's health literacy level as influenced by education, culture, language and the characteristics of health-care related settings (Nielsen-Bohman, Panzer, & Kindig, Eds., 2004). This committee was composed of individuals with experience in the public health field, the medical field, health communication nursing, sociology, adult literacy, anthropology, and education. The committee was directed to "define the scope of the problem of health literacy, identify the obstacles to creating a health-literate public, asses the approaches that have been attempted to increase health literacy in the United States and abroad, and identify goals for health literacy efforts and suggest approaches for overcoming obstacles to health literacy" (Nielsen-Bohlman, Panzer, & Kindig, 2004, p.27). The committee helped to identify and organize which factors influence literacy and health literacy, and defined an individual's health literacy as influenced by education, culture, society and the characteristics of the health-care related settings and the health care system (Nielsen-Bohlman, Panzer, & Kindig, 2004). Based on this information, a conceptual framework was developed which, although not a causal model, portrays the relationship between health literacy and collaboration between those sectors that potentially affect health

outcomes. This framework also points to areas of challenge, opportunity and intervention, to improve health literacy (Nielssen-Bohlman, Panzer, & Kindig, 2004).

To explain the relationship between oral health literacy and oral health outcomes, the dental community adapted the original health literacy conceptual framework (Fig. 2), modifying the central concept (health literacy), but leaving intact the interactive factors that mediate oral health literacy and oral health outcomes. This framework (Fig.3) was utilized by Horowitz (2008) to explain the interplay among oral health literacy, culture and society, the health system, and the education system, and their collective role in determining oral health outcomes and costs as explained by Nielsen-Bohman, Panzer and Kindig, Eds. (2004) when determining factors associated to health literacy. This framework will serve as the starting point for this study, and from which the research questions are drawn.

The interaction between the sectors mentioned in the conceptual framework, and their relationship with health literacy in general and oral health literacy in specific, is discussed in sections below.

Culture, Society and Health Literacy.

Some of the cultural conditions mentioned in the literature are also considered social determinants of health and might have an effect over health literacy. Language, gender, age, socio-economic status, race, ethnicity, and influences from the mass media are seen as factors that determine the individual's reaction, beliefs, and pathways to follow in the quest for health care, as well as their level of health literacy (Kutner, et al 2004). Low health literacy is present in all demographic groups, although it shows

markedly among minority groups (Figure 5), including non-white racial and ethnic groups, the elderly, individuals with lower socioeconomic status, and those with lower education levels. It is also observed in those with some disability, low English proficiency (LEP) individuals, and those whose primary language is other than English.

Studies have shown a correlation between demographic characteristics, such as race and ethnicity, and health literacy levels (Kutner, et al 2006; Lehna & McNeil, 2010), and age and literacy levels (Benson & Forman, 2002). The results of the national assessment (Figure 5) of adult health literacy performed in 2003 showed that nearly 40% of Hispanics scored at the below-basic prose level of literacy, and White and Asian/Pacific Islander adults posed higher average prose, document, and quantitative literacy when compared to Black and Hispanic adults (Kutner et al., 2006; Nielsen-Bohman, Panzer, & Kindig, 2004). These studies also reported that African American adults, regardless of background, had higher average prose and document literacy than Hispanic adults, and Hispanic adults had the lowest average scores on health literacy when compared to any other racial group.

Furthermore, research found that adults whose first language was English scored higher in health literacy than those whose primary language during childhood was Spanish (Kutner et al, 2006, Singleton & Krause, 2009). "An inability to speak English at all or the ability to speak with only limited proficiency presents additional obstacles to understanding health information and accessing health care" (Nielsen-Bohman, Panzer, & Kindig, 2004, p. 22). Based on these statements, it was concluded that the Hispanic population faces language barriers, not knowing what to do or when to seek care. In

addition, this population showed concerns about confidentiality, discrimination, and shame in admitting a lack of reading and comprehension skills (Coffman & Norton, 2010; Kutner et al, 2006; Lehna & McNeil 2010; Nielsen-Bohman, Panzer, & Kindig, 2004).

In a study of Brice et al., (2008) Spanish-speaking participants were matched with English-speaking participants and tested on health literacy using the TOFHLA in their native language (English or Spanish). Comparatively, English-speaking participants had better scores in the test than Spanish-speaking participants (90.78 vs. 59.72, respectively), with an established association between the TOFHLA scores and years of completed school, as well as with self-assessed reading ability. Additionally, 74% of the Spanish-speaking participants scored in the less-than-adequate functional health literacy level, compared with the 7% of English-speaking participants.

Research has come to the conclusion that, along with the African-Americans, the Hispanic population has a low rate of health services usage (Ashton et al. 2003), and compared to the white population, Hispanics have lower incomes, less education, and a lower rate on following up on doctor's orders. Cultural and language barriers also account for the low rate of health service utilization among the Hispanic population (Sarfaty, Turner & Damotta, 2005). A study presented by Garbers & Chiasson (2004) researched the "association between inadequate functional health literacy in Spanish-speakers among low-income Latinas aged 40 and older and cervical cancer screening knowledge and behavior" (Garbers & Chiasson, 2004, p.1). This study was performed with the participation of 205 Latinas of various nationalities, and utilized the Spanish

version of the TOFHLA. The authors concluded that approximately 50% of the population under study had difficulty interpreting written medical materials, even in their native language (Spanish), and after controlling for other factors, such as age, educational level, having a source of care, having health insurance, and years in the United States, this population had a lower rate of having a Pap Smear test.

Available literature on cultural beliefs and their association to oral health is at best limited, although, along with cultural beliefs, cultural preventive care values have an association with dental care practices (Butani, Weintruab, & Barker, 2008). Studies conducted in the general population reflect that white adults have a stronger belief in preventive care when compared to Native Indians, Asians, African-Americans, and Hispanics; as well as do women over men, and those of higher education level (Carr, Beebe & Jenkins, 2009; Davidson & Andersen, 1997; Atchison, Davinson, & Nakazono, 1997).

Dental knowledge and attitudes of 500 parents in England were studied by Williams, Whittle and Gatrell (2002), to examine the association between these factors and socio-demographic determinants. Based on the results of this study, ethnicity, educational levels, and living in deprivation had an impact on dental knowledge and attitudes, thus affecting oral health and general health as well. As per the results of the study, Asians had lower levels of dental health knowledge when compared to the white population participating in the study, and also showed less-positive attitude regarding dental health. Of the examined factors, ethnicity was the most significant factor (with a p=0.000, OR 0.190, and a CI of 95%), followed by the education levels.

Further studies, such as the one performed by Yuen et al. (2008), examined dental health knowledge among black adolescents, and its association with factors such as the source of dental health information, socio-demographic characteristics, and presence of routine dental care. The authors conducted the study among the adolescent population of rural South Carolina, U.S., with a convenience sample of 151 participants between the ages of 10-18 years old. The results of this study allowed the authors to determine the adequacy of overall dental health knowledge for this population as low, regardless of age—although over 2/3 of the participants (67.6%) identified bleeding gums as a sign of periodontal disease and the consequences of losing teeth due to periodontal problems (Yuen et al., 2008). Other data acquired during this study included the sources of information used by the participants. The identified sources were dental professionals, family, school, mass media, and friends. The results showed dental professionals and school as the main sources of information, linking this factor, as well as regular dental care, to a higher periodontal knowledge level. Adequate caries prevention knowledge was determined to be significantly associated to "being older, and receiving information from professionals, family, school, mass media and friends" (p. 19).

In addition, dental health knowledge, perception of oral health status, and practices of oral hygiene was found different between parents and child care staff (Modifi, Leldin, & Rozier (2009), in adults with diabetes (Yuen et al, 2009), in Whites compared to Asians (Williams, Whittle, & Gatrell, 2002), and among Hispanics (Luciano, Overman, Frasier, & Platin, 2008). Moreover, the sources of dental health

information can bear an association with existing dental knowledge about hygiene, caries prevention, and periodontal disease (Yuen et al, 2009).

While African-Americans mostly follow the patterns of their White counterparts in regards to oral health practices and beliefs, the older sector of the Chinese population holds beliefs based on the Traditional Chinese Medicine framework, and a combination of old folks' remedies and family advice guides the Hispanic population in their personal and childrens' dental care (Butani, Weintraub, & Barker, 2008).

Focusing on literature pertaining to Hispanic oral health, one study showed that compared to other ethnic groups, such as White and non-Hispanic blacks, the Hispanic population has the lowest rate of use or most negative beliefs concerning preventive care in regards to oral health (Adair et al, 2004). Furthermore, Hispanics showed higher levels of untreated dental caries, missing teeth, presence of calculus, gingival inflammation, attachment loss, and periodontal pockets (Ahluwalia & Sadowsky, 2003; Watson & Brown, 1995). In regards to oral hygiene practices, although participants of several studies claimed to brush their teeth least once a day, most revealed low frequency of flossing and difficulties in implementing preventive practices, such as tooth brushing, in their oral care behavior (Adair et al, 2004; Luciano et al, 2008).

A study performed by Lukes (2010) concerning oral health knowledge, attitudes, and behavior of the migrant population took place among parents of pre-school children. The study revealed that the majority of the participants were Mexican natives, with a preference of communicating in Spanish. Research in oral health care showed a higher number of visits to a dental provider for children, although a significant number of them

(19/45) did not have a dental visit in the year previous to the study. Participants cited reasons for not have seen a dentist, including no pain or problems, having no dental care provider, and limited access to care. In terms of knowledge, the participants exhibited limited understanding or incorrect behavior concerning preventive practices, diet, and good oral health assumptions.

Graham, Tomar and Logan (2005) conducted research concerning perceived social status, language, and identified dental home (the dental facility, private, or community health center providing comprehensive dental care) among Hispanics in Florida. These authors concluded that those who spoke a language other than English at home were less likely to have a dental home, and that poor communication skills may be a factor in effective interaction between patients and health care providers.

Educational System, Educational Attainment, and Health Literacy

The educational system's role in the present framework consists of the proposed development of an individual's numeracy, reading, and comprehension skills, mostly in an English-speaking curriculum that goes from grades K-12, as well as those programs providing adult educational enrichment and improvement of reading, writing, and numeracy skills. According to St. Ledger (2001), schools have a responsibility to provide students with skills that would allow them to cope with changes in their life, adjust to live events, and cope with self-perceptions and social relationships issues. All these concepts can be integrated into the school educational framework, allowing for the development and achievement of health literacy skills as described by Nutbeam (2000). Irrespective of

the previous statements, the report of the NAAL (2003) on the findings of the first national literacy assessment found that low educational attainment (not necessarily years of schooling) is linked to levels of health literacy. This assessment found that those with low educational attainment scored low in health literacy. It was also observed that even when there was an increased in educational attainment, over 40% of high school graduates and over 10% of college graduates scored at basic or below on health literacy.

Several studies have explored the link between education and health outcomes, and found that some of the pathways that link education and educational attainment, directly or indirectly, to health outcomes are employment, income, social status, and more recently, health literacy (Baker, 2001; Baker, Parker, Williams, Clark and Nurss, 1997; Kutner, et al 2004; Olives, Patel, Patel, Hottinger Miner, 2011; Schillinger, Barton, Karter, Wang, & Adler, 2006; Winkleby, Jatulis, Frank, & Fortman, 1992). Participants of those studies showed characteristics that were linked to low or poor health literacy levels, such as unstable housing, self-reported poor health, and holding a non-professional white-collar job. The literature included studies that showed a strong relationship between education levels, with health literacy as a mediator, and the rate of mortality associated to hypertension, myocardial infarction, better glycemic control in diabetic patients, and overall life expectancy (Hypertension Detection And Follow-Up Program Cooperative Group, 1997; Schillinger et al, 2006; Winkleby et al, 1992).

With literacy levels below 3rd grade, a person lacks the basic skills to read, fill a job application or similar form, or perform basic numeracy operations, thus encountering more difficulty in performing a required task or acquiring a desired job, thus leading to

impoverishment and all of its associated health risks (Baker, Parker, Williams, Clark, & Nurss, 1997; Weiss, Reed, & Kligman, 1995). Furthermore, literacy levels between 4th and 8th grade will have an effect on reading and comprehension of health educational material and prescription labels, determining dosages and administration of medications, reading appointment slips, and following post-operative instructions (Davis, et al, 1991; Doak, Doak and Root, 1996).

Research has concluded that the majority of educational material is written at an 8-12th grade reading and comprehension level (Nielsen-Bohlman et al., 2004, Wilson, M., 2009). It has been found, however, that the appropriate level for this material should be around 3rd to 5th grade level. Davis et al. (1990) studied reading comprehension and the readability of patient education materials. The author concluded that 60% of the participants were reading at least three grade levels below the last grade attended at school. Furthermore, out of the 150 pieces of patient health education materials reviewed, only nine were written below a 9th grade level. The inability to process this information and convey past or existing medical history, or understand medical terms and possible complications from a procedure could generate critical outcomes—which in turn could place an individual at a disadvantage in receiving optimal health care, with serious and even dreadful consequences.

"Education is a more powerful determinant of health status for some racial/ethnic and nativity groups than it is for others," as well as than other socioeconomic determinants (Kimbro, Bzostek, Goldman, & Rodríguez, G., 2008, p.370). Oral health status and educational levels were the focus of a study done by Paulander, Axelsson and

Lindhe (2003). These authors found that low educational levels were associated with a higher caries index, poor gingival health, and poor overall oral health, regarless of age of the participants.

Irrespective of educational attainment, other challenges are encountered when individuals with acute and chronic health conditions make an effort to sort out existing information and access the health care system in order to control their personal health care (Davis et al. 2002; Davis & Wolf 2004; Baker et al. 2007).

Healthcare System, Services Utilization, Costs, and Health Literacy

The skills to navigate the healthcare system, to make decisions about when to seek attention for a condition, knowledge of where the available health care resources are located, and whether or not the individual understood the instructions of how to take a medication or how to proceed regarding further treatment are also affected by low-literacy levels. The U.S. has allocated unlimited resources to maintain the right of health of its citizens, but this effort does not come at zero cost. The commitment to preserve this right consumes large amounts of resources, such as finances and time, in implementing professional training, development of programs, and community efforts. According to the Centers for Medicare and Medicaid Services (2011), for the year 2008, the United States national health expenditures "reached $2.5 trillion, which translates to $8,086 per person or 17.6 percent of the nation's Gross Domestic Product" (Centers for Medicare & Medicaid Services, 2011, para.1). Of this amount of money, more than $3.5 million is attributed to the costs of health literacy related outcomes. Furthermore, the IOM report of 2004 (Nielsen-Bohman, Panzer, & Kindig, 2004) stated that, in 1996, an expenditure of

$29 billion in health care can be attributed to services provided to individuals with low levels of literacy.

In the study performed by White, Chen, & Atchinson (2008), based on data from the National Assessment of Adult Literacy survey of 2003, lower literacy levels were associated with less utilization of preventive services, such as Pap Smear, dental and vision checkups, osteoporosis screening in women, and prostate screening in the male population. The authors concluded that the population in the age group 16 to 39 had the lowest rates of utilization of these services.

Another study performed by Weiss and Palmer (2004) utilized the Instrument for the Diagnosis of Reading (IDR) to determine literacy skills and their association with higher health care costs among the Medicaid-enrolled population. The authors found that even after adjusting for socio-demographic cofounding variables, those with low reading skills demonstrated a statistically significant difference in health care costs when compared to those with adequate reading skills.

Cho, Lee, Arozullah and Crittenden (2008) studied the relationship between health literacy and health status, and health literacy and health service utilization in the elderly population. Their study hypothesized that people with lower literacy levels would demonstrate less disease knowledge, poorer compliance, and less preventive care utilization, thus affecting health status and increasing the use of emergency room (ER) and hospital services. With the use of the TOFHLA, their study revealed that health literacy is not completely associated to the increase in visits to the ER by the elderly, although it had "a direct rather than indirect effect on health outcomes" (Cho, et al. 2008,

p.1813). Other authors present in academic literature, such as Baker, Parker, Williams

and Clark (1998), revealed that lower health literacy level was associated with an

increase in hospital admissions. Howard, Gazmararian and Parker (2005) reported as well

on health literacy and medical care use, as well as costs for the elderly population. Their

study utilized the TOFHLA to determine levels of health literacy, and included a sample

population from several states of the United States. The results showed significant

differences in costs between those with low and adequate health literacy, especially for

the emergency room setting, concluding that low or inadequate health literacy could

increase medical costs, and that these patients had an 'inefficient mix' of medical

services. Additionally, the risk of admission and hospital care costs (excluding outpatient

related costs) due to unintentional omission or conflict among medications, also known

as preventable adverse drug event (ADE), might be the result of low literacy levels and

poor understanding of the proper use and instructions of medications. These events

accounted for $3.5 billion in medical expenses for the year 2006 (Aspden, Wolcott,

Bootman, & Cronenwett, Chapt. 3, 2006).

Authors have recognized the complexity of what will be the health outcomes

related to health literacy with the upcoming health care reform and the establishment of

essentially universal coverage for 16 million Americans and sponsoring insurance options

for another 16 million low-income Americans. This reform, and the possibility of

subsidizing those who need financial assistance with health care access and costs, will

only be successful if those individuals who will be participating for the first time in the

public health system are capable of understanding what is being offered and how to process the required paperwork adequately (Somers & Mahadevan, 2010).

Translating Health Surveys and Questionnaires

Vital health information can be recovered by the use of appropriate surveys and questionnaires. As a result of the increase of immigrants to the U.S., of multiple nationalities and languages, existing tools do not always accurately collect the necessary information required to address the health needs and concerns of these populations. In order to accomplish this task successfully, it is often necessary to translate existing tools in a way that portrays linguistic and cultural precision (Willis et al, 2008). There are a range of methods and adjuvant techniques used to accomplish this task, including translation- back-translation (Brislin, 1970), cognitive theory interviewing, behavioral coding (Willis & Beatty, 2007; Willis et al, 2008), and item response theory (Ellis, Minsel, & Becker, 1989).

Translation Back-Translation method. Introduced originally by Brislin (1970) in the decade of the 1970's, the translation-back-translation method was used to translate sensible data needed in the military branches for precise training of military personnel. More recently, this method has been used in several studies for the translation of health questionnaires, surveys, and other clinical instruments required for cross-cultural utilization (Gandek & Ware, 1998; Lepos-Ferrari et al., 2010; MAPI Research Institute, 2002; Medrano et al., 2010; Tamanin et al., 2002; Walrath et al, 2004). In the translation-back-translation method, a complete translation of the original document written in the original language or source language (SL) is translated to the target language (TL) and

then translated back to the SL. The translations are performed by professional translators, bilingual in the SL and the TL. The second step, or back translation, is done to evaluate equivalency of concepts between the original document and the TL, and resolve discrepancies between the documents. This is usually done by the translator and the primary investigator, and the document is translated once again and evaluated further until no discrepancies are found and equivalency of concepts is achieved. Maneesriwongul and Dixon (2004) recommend the use of back-translation (as opposed to the use of only forward translation) and pre-testing of the tool with the targeted population to achieved adequate internal consistency and validity as the minimum standard for the translation and development of cross-cultural instruments.

Translation-back-translation was used to develop Spanish-language versions of the Child Behavior Checklist and the Family Assessment Device (as stated on Walrath, et al, 2004). The internal consistency and convergent validity of the Spanish version of these two scales were acceptable when correlated to other existing validated scales (Walrath et al, 2004). This translation method is considered the "gold standard" process for translation of study instruments (Medrano et al, 2010). It is important to translate instruments following the language specific to the country or region of the participants targeted by the research, and employ trilingual translators (i.e., English-Spanish-and the cultural language or targeted language) in order to achieve semantic equivalence and cultural appropriateness (Medrano et al, 2010).

In a study conducted to translate the Cultural and Psychological Influences on Disability (CUPID) into Brazilian Portuguese, Lepos-Ferrari et al, (2010) used the

standard process of translation-back-translation, including an evaluation by a judging committee, and pilot testing as the final step. After adopting the modifications recommended by the judging committee and analysis of the pilot test, the authors concluded that the translated version of the CUPID questionnaire was a valid and satisfactory instrument to assess occupational disability in Brazilian nursing workers. Despite satisfactory results, the authors recommend that further studies be conducted with other populations.

When combining or comparing translation methodology in the same study, Rivera-Vasquez, Mabiso, Hammad and Williams (2009) used the translation-back-translation method via researcher-initiated model and community based organization initiated model to translate the Breast and Cervical Cancer Literacy Tools 2007 into Spanish and Arabic, respectively. Translators from different origins (Puerto Ricans, Dominicans, and Mexican) were used to achieve a translated version of the instrument to be used with different members of the Hispanic population targeted by the research. To develop the Arabic translation, bicultural and bilingual educators were used for the first translations, and a committee of community members and health-related workers for revision of the instrument. The Arabic version was then back translated by a second bilingual/bicultural health educator. The Spanish version was pilot-tested, and the Arabic version of the assessment was field-tested in a pre/post intervention approach with members of the targeted population. Analysis of the data yielded a Cronbach's alpha of 0.82 and 0.69 for the Spanish and the Arabic version of the cervical cancer assessments, respectively. This resulted in a Cronbach's alpha reliability of 0.69 for the Spanish

version, and 0.81 for the Arabic version of the breast cancer assessment. Given these

results, the authors concluded that both translated versions were "equivalent to the

English version of the tools" (Rivera-Vasquez, Mabiso, Hammad, & Williams, 2009, p.

325).

To improve upon the gold-standard, Villalonge-Olives et al (2008) combined the

translation-back-translation method with the use of cognitive interviewing via semi-

structured interviews to assess conceptual equivalence and psychometric properties of the

translated document for the conversion the Coddington Life Events Scales (CLES) into

Spanish. The use of this combined methodology and reliability testing, utilizing test-

retest, resulted in a comprehensible instrument, and the results of the analysis

demonstrated preliminary validity and relativity when compared to the English version

(Villalonge-Olive et al, 2008). Based on these results, the authors recommend the use of

this Spanish-language version of the scale in research populations from Spain. They

caution that there is a need for further validation in a larger population. Among the

strengths identified for this method are the reconciliation sessions between translators (to

determine concept definitions before translation (MAPI Institute, 2002)), the use of pre-

testing to allow for discrepancy recognition (Maneesriwongul, & Dixon, 2004), and the

identification of the difficulty-degree in the translation prior to field-testing (Bullinger et

al, 1998). Weaknesses of this methodology depend on the adopted steps or process used

to perform the translation, but include the lack of involvement of the targeted population

in the adaptation and conceptualization processes, which leads to a lack of culturally

accepted terminology adapted for the tool, and a possible lack of acceptance from the

targeted community (Carrasco, 2003). Also, the lack of a qualitative process to determine concept equivalency, the non-standardized or preset number of translators or qualifications of translators (either cultural or professional) (Cha, Kim, & Erleen, 2007), lower internal consistency between the original scale and the translated instrument (Walrath et al, 2004), and allocated time and budget (Maneesriwongul, & Dixon, 2004) are seen as potential weakness in the use of this translation technique. To avoid the limitations imposed by the use of translators as the only methodology for the task of translate a questionnaire, some authors might recur to the utilization of adjuvants techniques, such as cognitive interviews.

Cognitive Interviews

Emerging in the 1980s, the pure cognitive interviewing process used the "think aloud" method to capture thoughts and reactions from the participants. This process was accomplished without interruption of probes introduced from interviewers. As cognitive interviewing evolved to acquiring more information than just 'thinking process' statements, probes or guided questionnaires were introduced (Beatty & Willis, 2007). Recent applications of cognitive interviewing include the translation of health and diet questionnaires, surveys, and scales (Carrasco, 2003; Agans, Deebs-Sossa, & Kalsbeek, 2006; Levin et al, 2009; Villalonga-Olives et al, 2008). Cognitive interviewing is an acceptable method for identifying problems and issues of a conceptual and interpretative nature in regard to translated questionnaires. It involves a small group of participants, instructed to answer both open-ended and targeted probes posed by the interviewer (Carrasco, 2003; Levin et al, 2009). Based on face-to-face interviews or focus groups, the

goal is to probe for a reaction and interpretation of a tool from participants from the targeted culture or language. The results of the interviews have revealed issues with poor or inadequate translations, equivalency of concepts, cultural sensitivity, and appropriate use of concepts (Agans, Deeb-Sossa, & Kalsheek, 2006; Carrasco, 2003; Levin, et al, 2006; Villalonga-Olives et al, 2008).

In order to assess functionally equivalency between translated versions, the interviewer probes participants with the question or item in the TL, and the response received should be equivalent as if the item or question was received in the SL. Studies described linguistic issues found around functional equivalency, such as pre-existing bias due to linguistic and cultural recognition, frequency of term utilization by the TL, and literal translations not representing the proposed meaning of the SL version (Carrasco, 2003). Other problems that can be assessed through the use of cognitive interviewing are map design of questionnaire, the use of false cognate and homonyms that could trigger false responses due to inappropriate translation or interpretation from the TL population, and order of questions in the questionnaires (format of questionnaire) (Carrasco, 2003; Willis & Beatty, 2007). In particular, Levin and colleagues (2009) found issues related to the unfamiliar or different meanings according to region or nationality of the Spanish-speaking participants, and the difficulty of Spanish words to communicate the intended construct of the original tool.

Additional benefits of this method are the use of native speakers of the TL, the opportunity to record the reaction to the translation prior to field-testing the tool, and providing alternate means to assess conceptual equivalence across ethnic and racial

groups. A limitation reported by Levin et al (2009) is the need to use seasoned interviewers that could establish rapport with the participants, therefore increasing the cost of the study and the need to stipulate and establish with all participants that the interview is to collect qualitative data from the translated tool and not qualitative data of the participant's health or habits. While some researchers will continue using the cognitive interviews as their translation method, others will center their research in more exhaustive methods, such as the Item Response theory.

Item Response Theory

Item Response Theory (IRT), also known as latent trait theory, strong true score theory, or modern mental test theory, is defined as "test analysis procedures that assume a mathematical model for the probability that an examinee will respond correctly to a specific test question, given the examinee's overall performance and characteristics of the questions on the test" (The Nation's Report Card, n.d.). A mathematical function, which assigns a probability to correctly to answered items in questionnaires and surveys, can be applied to single items, multiple-choice responses, or Likert scale items. It takes into consideration the difficulty (location) of the item, the trait (ability, anxiety, or strength of an attitude) of the person, and item parameters, such as discrimination (against other possible questions) and pseudo-guessing. In other words, it describes the probability of a person's answer to a questionnaire in terms of the level of presence of such trait or construct. Introduced in the 1950s, this method for item response modeling did not become popular until the 1970 and 1980s.

Several authors have used this method in the translation of cross-cultural health questionnaires and surveys (Burlew, Feaster, Brecht, & Hubbard, 2009; Ellis, Minsel & Becker, 1989; Orlando & Marshall, 2002). The advantage of this method for establishing conceptual equivalence of survey construction or translation is the accuracy and precision of the mathematical formula that allows the researcher to "tailor their instrument for maximum precision" (Reeve & Fayers, 2005, p.72). The research then has the ability to add or rearrange domains within a questionnaire (Bruce et al., 2009; Sabbahi, 2007), and delete irrelevant questions or domains (Prieto, Thorsen, & Juul, 2005). The major disadvantage of this method is the difficult or lengthy mathematical equation required to analyze the constructs.

Summary and Transition

This chapter reviewed literature pertinent to oral health literacy and available assessment tools. The literature showed an existing gap, where there is no an available tool to assess oral health literacy in the Hispanic population. The review also involved literature available on translation techniques for available tools. After the review of available methods for tool translation, and based on the needs of this study, the phase that consists of the translation of the REALD-30 will be completed with the utilization of the translation-back-translation method. The following chapter will describe the proposed study's methods, including design, setting, population, sample, instrumentation, and data collection and analysis.

Chapter 3: Research Method

As I discovered in the review of the literature, a valid, Spanish language oral health literacy assessment did not existed prior to this study's proposal. Before public health practitioners can develop and implement interventions, they need to estimate the extent to which oral health literacy impacts the Hispanic community. Without a valid, Spanish language oral health literacy assessment, obtaining estimates of oral health literacy among Spanish-speaking Hispanics remained a challenge. In this chapter, I address the type of study design I used, and provide explanations of my population sampling approach and selection of the target population, type of variables, data collection instruments and methods, data analysis, and threats to validity associated with the different components of the methodology. Ethical considerations and data protection protocols, as well as the pilot study protocol, are also discussed.

In the literature review I found that health literacy has an impact on health outcomes, affecting treatment compliance and acquisition of appropriate treatment, thereby increasing complications and medical expenses. The review of literature also showed that oral health literacy has a relationship to lack of dental care, incorrect knowledge of dental information, and perceived oral health status. I also found that gender, age, and health insurance status, among other variables, are potential confounding factors. Various tools are available to measure health literacy and oral health literacy levels. After reviewing the literature, I found that there was not a translated, validated Spanish version of any the oral health literacy tools available. I thus designed

this study to translate and validate a Spanish version of an existing oral health literacy tool.

Research Design and Approach

The majority of studies I reviewed regarding health literacy and oral health literacy used a quantitative approach for data collection and analysis. The purposes of these studies were to establish validity of the instruments used to measure health literacy and oral health literacy. In other studies, researchers have established the relationship of literacy levels with health outcomes, such as asthma control, diabetes knowledge, medication adherence, and health care service utilization. Researchers studying oral health literacy have also explored validation of instruments in English, and the relationship between oral health literacy and oral health outcomes, dental knowledge, dental visits, and oral health status. However, studies to validate a Spanish version of an oral health literacy tool have not yet been undertaken. Several sources of data must be compiled and analyzed in order to validate such tool and to understand the relationship between oral health literacy and dental care in this population.

According to Creswell (2003), modification of a previously validated instrument requires that the new version be validated, and its reliability reestablished. Therefore, in order to comply with this requirement, I had to establish the validity and reliability of the questionnaire to be used in this study before using it. Instrument validity is the extent to which an instrument measures those concepts for which it was constructed or "to which the interpretations of the results of a test are warranted" (Kimberlin & Winterstein, 2008, p. 2276). Validity can be established by correlating the scores with a similar instrument,

convening an expert review, or testing of the instrument in multiple studies to accumulate

evidence linking the variables tested in the instrument to the construct under study

(Kimberlin & Winterstein, 2008). "Reliability means consistency in research whereby a

measure would give the same results over and over again" (Trochim, 2001, p. 92), and

can be established by stability of measurement or test-retest reliability, internal

consistency, and interrater reliability. For a specific instrument, the score which measures

the construct is composed of the true score and the error score. The true or unknown

score is the one that is assumed if the instrument was constructed to perfection, and it is

the researcher's responsibility to identify those areas in the test that, if not corrected, will

prevent the emergence of useful and accurate responses (Kimberlin & Winterstein, 2008).

Achieving these characteristics of data collection and analysis can provide the standards

of quality, therefore producing reports that will be trusted and providing answers to the

proposed questions of research and social science. In order for the latter to happen,

researchers must maintain objectivity, even when a close relationship with the

participants is established.

There are several research designs that can be used to help translate and validate a

tool. In designing this research, my main goal was to validate a Spanish version of an oral

health literacy assessment tool. In order to accomplish this goal, I used a cross-sectional,

correlational design guided by the oral health literacy theoretical framework.

In this study, I used a quantitative, descriptive correlational design to examine

correlation between oral health literacy, health literacy, and oral health quality of life to

establish the validity and reliability of the Spanish version of the REALD-30. A non-

experimental design was selected because the independent variable under study, oral health literacy, cannot be manipulated. Other reasons for selecting this design were the size and diversity of the population, and the use of a survey questionnaire.

Setting and Sample

The population of this study was defined as the following: Hispanic, ages 18 and over, bilingual (English and Spanish speaking), and living in the state of Texas. I selected the sample population using a convenience sample, where I purposively sought out and sampled participants from a pre-specified group. Reasons for selecting this sampling technique were the relatively low cost and time required to carry out a convenience sample, when compared to other techniques. I sought the sample population from community health centers in the south of Texas. Given the purpose of the study and convenience sample, I specifically restricted the sample to Hispanics over the age of 18. While this restriction does limit generalizability of the results, the sample restriction does help minimize issues with interpretation of the results that could result from underrepresentation. In addition to the exclusion of other populations, the exclusion criteria included vision impairments that cannot be corrected by the use of vision aids.

Sample Population Methodology

For this validation study, I estimated the sample size based on psychometric statistics and expert recommendations. These recommendations indicated that I should use the same sample size similar to what was used when the English version was created. Therefore, I used a sample of 114 participants. This sample size was also used by several authors in the translation and validation of other assessment tools in the medical field.

Instrumentation and Materials

In this subsection, I describe the instrumentation, data collection, and analysis based on the two phases of the research and the corresponding research questions.

Phase 1: Translation of the Oral Health Literacy Assessment Tool, REALD-30

I used the REALD-30 in the translation-back-translation process to develop the Spanish version for validation. The REALD-30 was created based on the Rapid Estimate of Adult Literacy in Medicine (REALM) by Lee et al. in 2007. The creation of this assessment "followed a disease-specific framework that included etiology, anatomy, prevention, and treatment categories" (Lee et al., 2007, p. 94) to compile words for the initial development of the test. The authors used the American Dental Association *Glossary of Common Dental Terminology* for the selection of terms. They also used brochures and written materials available to them to include terms commonly found in these materials.

REALD-30 scores were correlated to those derived from the REALM and the TOFHLA to establish convergent validity by Pearson's correlation. Predictive validity was determined by assessing whether the REALD-30 was associated with health outcomes at a statistically significant level (Lee et al., 2007). This instrument was validated as a word recognition test, with good convergent validity and internal consistency. Lee et al. (2007) noted that "The correlations were 0.86 and 0.64 for REALM and TOFHLA, respectively, suggesting that REALD-30 has good convergent validity" (p. 96). Scores for this test range between 0 (lowest literacy) and 30 (highest literacy). Previous authors (Lee et al., 2007) who have used this test have established a

score of 22 as a low literacy score, while Vann et al. (2010) arbitrarily defined low literacy as "the lowest quintile or score < 13" (p. 1396). For the purpose of this study, I followed the scores from the original validation study. I considered scores of 0–13 to be indicative of low literacy, 14–22 to be indicative of marginal literacy skills, and 23 and over to be adequate or high literacy skill. No other changes were made to preserve the validity of the original questionnaire.

I developed the SREALD-30, a Spanish-language version of the existing and previously validated REALD-30, using the translation-back-translation method and expert review committee evaluation.

Phase 2: Validation of the SREALD-30

The oral health questionnaire I used included closed-ended questions to collect socio-demographic characteristics about this particular population. The possible answers to the closed-ended questions were mutually exclusive and exhaustive, as each question had to be answered with only one response. The My use of closed-ended questions allowed me to collect accurate data, avoid respondent misinterpretation of the questions and ambiguity in their responses, and minimize the potential for double-barrel questions.

The socio-demographic section of the survey facilitated collection of information and variables important for data analysis, and assisted in the answers of specific hypotheses. The specific variables I assessed included age, educational attainment, income, and insurance coverage. I also used the questionnaire to gather data regarding perceived oral health status.

The questionnaire (Appendix A and B) I used for this study was based on the questionnaire used by Luciano et al. (2006) during their study concerning oral hygiene practices and dental care among Hispanic population in North Carolina. The original questionnaire created and validated by Luciano et al. (2006) was divided into six sections: dental health care habits, dental visits, condition of gums, knowledge and beliefs about gum disease, concerns about teeth and gums, and demographic information. A total of 41 questions about participants' demographic characteristics, dental care practices, perceived oral status and needs, and experiences of dental care comprised the original validated English and Spanish version.

I made some changes to the original questionnaire version to assure collection of relevant data that would help to answer the research questions significant to this study. I added the single self-perceived oral health status assessment (Atchison & Gift, 1997; Locker, 1997) to the perceived oral health status and needs section, for a total of 43 questions.

I coded the country of origin as a nominal variable, with the following five categories: (1) United States, (2) Mexico, (3) El Salvador, (4) Puerto Rico, and (5) Other (with write-in option), based on the information from the 2010 Census concerning the largest Hispanic groups living in the targeted state. While age (years) were collected as a continuous variable, for the purposes of the analysis, I recoded this variable as an ordinal variable based on the following intervals: 18-29 years old, 30-39 years old, 40-49 years old, 50-59 years old, and 60 years old and over. I measured income, by self-reported weekly take-home pay, and coded it as an ordinal variable into the following categories:

(1) less than $100 per week, (2) $100-200 per week, (3) $201-400 per week, (4) $401-600 per week, (5) $601-800 per week, and (6) more than $800 per week. Educational level, was measured by self-reported highest grade level completed, and I coded it as an ordinal variable into the following categories: (1) less than 6th grade, (2) 6-8th grade, (3) less than 12th grade, (4) high school graduate (or GED), (5) some college (no degree), and (6) college graduate or higher.

Self-perceived oral health status is a personal description of the oral health from the participant's point of view. For the purpose of this analysis, I coded self-perceived oral health status as a dichotomous variable reflecting 'Excellent or Good' and 'Fair or Poor' responses.

Oral health impact profile spanish version (OHIP-14sp). The original tool, the Oral Health Impact Profile-14, is a 14-item questionnaire designed to measure how oral health conditions impact and limit a person's daily living, and focuses on seven dimensions of impact (functional limitation, pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap). Scores are based on a 5-point Likert scale, ranging from never to very often. It was based on the original OHIP created and validated in 1997 (Slade, G., 1997).

The OHIP-14sp is a translation of this instrument performed by Montero-Martin, Bravo-Pérez, Albaladejo-Martínez, Hernández-Martín, and Rosel-Gallardo (2009). This version was validated in a cross-sectional study done in Spain. The authors used the back translation technique to translate the tool to Spanish, achieving cross-cultural equivalence, face, and content validity from an expert committee. Montero-Martin et al. (2009) tested reliability by internal consistency with an inter correlational matrix, which yielded a positive correlation between items of 0.10 to 0.63, enough to be considered to have no redundancy between items. This assessment tool also achieved a Cronbach's alpha of 0.89. The criterion validity of the OHIP-14sp was established comparing the results of the tool to those of the single-item assessment of perceived treatment need, while the construct validity was determined by correlating the OHIP-14sp scores to the scores of the original OHIP-14.

The authors found that this translated tool was valid and achieved good consistency, and considered it a well-designed assessment tool for determining the impact of oral health condition over daily function in the Spanish-speaking population.

Short Assessment of Health Literacy for Spanish-speaking Adults (SAHLSA). The SAHLSA is a Spanish oral health literacy assessment tool, created by Lee et al. (2006) after the REALM. It is a reading skill and comprehension assessment tool, with a structure consisting of a stem word, a correct choice to compare, and a distraction word which is plausible but incorrect. The tool assesses health literacy by reading skills and correct association of a key word. Each correct choice allocates a point,

for total of 50 points, and a score between 0 and 37 implies inadequate health literacy levels. The selection of terms was chosen using the Delphi process by an expert panel in a two-step process. The first step involves a translation of the 66 words used in the REALM into Spanish, and the second step consists of the selection of the key word and distractor for each translated word. The committee used the dictionary definition and daily usage of terms in the final selection of terms and development of the tool. The authors determined the validity of the tool by psychometric assessment throughout an interterm correlation matrix and item response theory, eliminating 16 of the original items. They also determined test-retest reliability of this instrument in a subsample of (40 out of 201) of the Spanish-speaking participants in the study, achieving reliability of 0.86 measured by Pearson's, and the internal reliability achieved by the tool was 0.92 by Cronbach's alpha. When testing the design of the instrument, it yielded a Pearson's correlation with the original TOFHLA of 0.65 in the Spanish speaking participants, and a correlation of 0.76 with the REALM in the English speakers'. The authors concluded that this tool is a valid assessment for use with Spanish speakers from different ethnic backgrounds.

Data Collection

As with the previous sections, the data collection and analysis will be described based on the two phases of the research.

Phase 1: Translation of the Oral Health Literacy Assessment tool REALD-30

After a thorough review of existing literature on translation methodology, the translation-back-translation (Figure 8) method was selected for the translation of the

REALD-30. The original version of the REALD-30 was translated to Spanish by two professional translators of Hispanic origin, and face validity determined by an expert panel. The professional translators of Hispanic origin independently created two versions of the tool, which were compared for conceptual equivalence and discrepancy resolution. From this step, one version was created and back-translated by a third independent translator of Hispanic origin who had not seen the original version of the tool. This new English version was then compared to the original version of the REALD-30 to determine content validity. If content validity was achieved, a panel of experts, composed of two dental providers and a health literacy expert, would review the final version for face validity and grant permission to field test. If content validity or face validity was not achieved or discrepancies could not be resolved, steps one and two would have been repeated until the tool achieves those parameters.
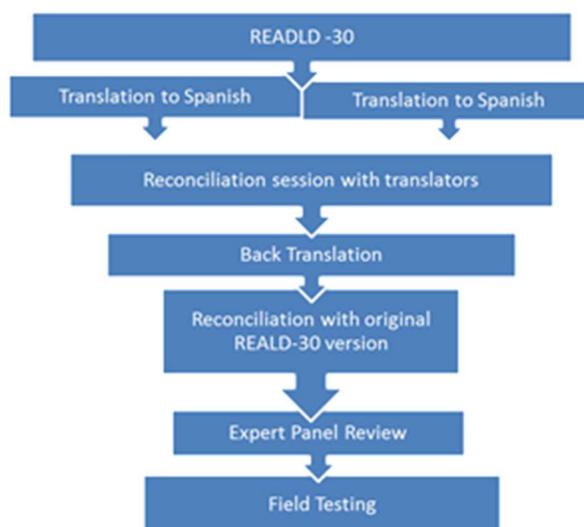
Figure 8. Translation Back-Translation Process

Phase 2: Validation of the SREALD-30

The focus of the study was quantitative methodology, and the study framed as a field test with a random subsample for test-retest. The field test started with a sample taken from participants (*N*=119) of community health centers in a southwestern state of the United States. A direct approach will be used to contact the potential participants of the study. Potential participants will be pre-screened by asking them their age, ethnicity and availability to participate in the study. Once individuals agree to participate in the study they will receive full explanation of the study, benefits and risks associated to their participation in the study, and consent forms.

Participants will be asked to answer the brief demographic and oral health questionnaire and the OHIP-14sp, followed by the Spanish-version REALD-30 and SAHLSA. A random subsample of 20 participants was selected to retake the SREALD-30 within 2 weeks of the first assessment. The SREALD-30 will be administered by the researcher in the same manner as the first time.

The field test was conducted with 114 Spanish-speaking respondents. I conducted the field test which involved administering the questionnaire, including the SREALD-30, SAHLSA-50, OHIP-14sp, questions about participant demographics, and perceived oral health status. Approval for the field study was obtained from the Institutional Review Board (IRB) of Walden University before beginning recruitment. Participants were informed of their right to participate, as well as refuse without penalty, the purpose of the study, and how it will contribute to positive social change. Consent forms were collected from participants to verify their willingness to participate in the study.

Data Analyses and Hypotheses Testing

The purpose of this study was to translate and validate an oral health literacy assessment tool. Two main research questions guide the purpose of the study: What is the validity of a Spanish-translated oral heath literacy assessment tool? What is the reliability of the tool for the Hispanic population?

The data collected from the oral health questionnaire, the REALD-30, the SREALD-30, SAHLSA-50 and OHIP-14sp was analyzed in order to answer the research questions and proposed hypotheses. Comparisons based on patient characteristics, as well as overall variables, allowed the researcher to answer the specific questions of the study. Prior to any hypotheses analysis, descriptive statistics were used to determine frequency, mean, and standard deviation of the variables. Descriptive statistics determined the mean, median, mode, standard deviation, range, and skewness of the collected data. Further analysis of the data consisted of using findings to answer research questions and hypotheses, assess similarities and variations of themes, interpretations, and categories between the responses acquired through the process of data collection.

In order to validate the Spanish-translated version of the REALD-30, face validity and content validity was established. Face validity indicates that the instrument appears to measure what it is designed to measure, and it was established at Phase 1 of the study by a committee of three experts in the fields of dentistry and health literacy after the translation is completed. Content validity is the extent to which the measurement incorporates the domain of phenomenon under study, and was also established by the expert committee once the translation process is completed during Phase 1. Once face

and content validity had been established, predictive validity was the next step of the process.

Predictive validity is used to assess whether an instrument significantly predicts a related outcome (Trochim & Donnelly, 2008). For the purpose of this study, predictive validity was assessed whether the SREALD-30 could significantly predict, oral health quality of life or perceived oral health status, holding age, education, and dental insurance coverage constant. Both RQ1 and RQ2 correspond to testing predictive validity of the SREALD-30.

RQ1: Does the SREALD-30 can significantly predict oral health quality of life as measured by the OHIP-14sp?

RQ2: Does the SREALD-30 can significantly predict quality of life or oral health status?

H01: The SREALD-30 score does not predict oral health quality of life as measured by the OHIP-14sp.

HA1: The SREALD-30 score predicts oral health quality of life as measured by the OHIP-14sp.

Statistical Analysis Plan: Predictive validity of the SREALD-30 on Oral Health Quality of Life was tested using Multiple Linear Regression analysis. The Dependent Variable was Oral Health Impact Profile (OHIP-14sp), Independent Variable was the SREALD-30 score, and covariates include age, education, and dental insurance coverage. Statistical significance was set at the alpha = 0.05 level.

H02: The SREALD-30 score does not predict oral health status.

HA2: The SREALD-30 score predicts oral health status.

Statistical Analysis Plan: Predictive validity of the SREALD-30 on Oral Health Status was tested using Multiple Logistic Regression analysis. Perceived Oral Health Status was dichotomized into two categories consisting of "Excellent/Good" and "Fair/Poor". The Dependent Variable was the dichotomous Perceived Oral Health Status, Independent Variable is the SREALD-30 score, and covariates include age, education, and dental insurance coverage. Statistical significance was set at the alpha = 0.05 level.

Reliability is the process that establishes the quality of measurement. In other words, reliability is the "consistency" or "repeatability" of the measurements taken by the tool. Reliability is most commonly examined using internal reliability, test-retest reliability, and convergent reliability (Trochim & Donnelly 2008).

RQ3: Does the SREALD-30 have good internal reliability?

H_{03a}: The SREALD-30 does not have internal reliability.

H_{A3a}: The SREALD-30 does have internal reliability.

H_{03b}: The SREALD-30 test-retest scores are not correlated.

H_{A3b}: The SREALD-30 test-retest scores are correlated.

Statistical Analysis Plan: Internal reliability was assessed by Pearson's correlation coefficient and factor analysis of the 30 items in order to test the homogeneity of the SREALD-30. The factor analysis provided further information on the dimensionality of the SREALD-30. Dimensionality similar to that of the REALD-30 would further support the internal consistency of the SREALD-30.

Statistical Analysis Plan: Test-retest reliability was assessed by means of the Pearson's correlation coefficient using the data from re-testing a subsample of the participants within two weeks of the initial assessment. A determination based on effect size (Cohen, 1988) was made to accept a Pearson's correlation higher than r >.5 as a significant correlation. The independent variable was the baseline SREALD-30 score, and the dependent variable was the SREALD-30 score at retest. This test provided an indication of the overall consistency between tests at different points in time, thus establishing stability of the assessment over time. The selection of this analysis method was based on the continuous nature of the SREALD-30 score. Statistical significance is set at the alpha = 0.05 level.

RQ4: Does the SREALD-30 have good convergent reliability with health literacy as measured by the SAHLSA-50?

H_{04}: The REALD-30 scores and the SAHLSA-50 scores are correlated.

H_{A4}: The REALD-30 scores and the SAHLSA-50 scores are not correlated.

Statistical Analysis Plan: Convergent reliability measures the extent to which one measure is related to other measures believed to assess the same construct (Trochim & Donnelly, 2008). Since there is no "gold standard" available for assessing the validity of the SREALD-30, I compared the tool with a well-known measure of general health literacy. Correlation between the scores on the Spanish REALD-30 and SAHLSA-50 was measured. Pearson's correlation was used to test convergent validity of the SREALD-30. Correlation values above 0.41 were considered to be acceptable.

Table 1 summarizes the analytical methods to be used in the study, with respect to the research questions and hypotheses. Due to the expected distribution of the data, two-tailed and non-parametric methods were utilized to complete the analysis. The analysis of the data was conducted by using the SSPS statistical software Version 21 (PAWS, 2010). Once the analysis was complete, and results were available, they would be shared via written reports and oral presentations.

Table 1

Validity and Reliability of the SREALD-30

	Instrument	Analytical Method
Convergent validity	SREALD-30	Pearson's Correlation
	SAHLSA-50	
Predictive validity H01a: The SREALD-30 score does not predict oral health quality of life as measured by the OHIP-14sp.	SREALD-30	
	OHIP-14sp	Multiple linear regression
	Perceived oral health status *Covariates: age, gender, education*	Multiple logistic regression
Internal reliability	SREALD-30	Factor Analysis
Test-retest reliability H02b: The SREALD-30 test-retest scores are not correlated.	SREALD-30	Pearson's Correlation

Role of the Researcher

The role of the researcher for this study was to coordinate the administration of the research instruments, as well as to assist in the collection of data and the data analysis. I was be responsible for providing safety mechanisms in data collection, transfer, analysis, and storage in order to secure participants' personal data and provide protection from unauthorized use of the collected data.

I have over 20 years of experience as a dental care provider, and experience in the community health sector as a dental educator at the doctorate level, also as dental director for community health centers in the South Texas region. I have experience working with a diversity of individuals in the medical and dental sector, and her ability to communicate

in both English and Spanish language allowed for the establishment of a positive a

relationship between agencies, officials, members of the community, and participants.

Data Management and Storage

Data management refers to the process of collecting, sorting, and storing data

(Clinical Tools Inc., n.d.) It is also the most valuable resource to an organization or a sole

researcher in the process of conducting a study. When this process is done in an effective

and efficient manner, it can result in helping in lower the cost of research by improving

access to necessary information, while simultaneously reducing the risk of data loss or

compromise.

Strategic collection and synthesis of information to guarantee research success

consists of several aspects, such as: conducting data collection in a consistent and

systematic manner, the establishment of an ongoing system for evaluating and recording

changes to the project protocol, storing data in a manner that allows for flexibility in

deciding how much data should be stored (allowing for potential study reproduction at a

future date), the protection of data from physical damage, protecting data integrity

(including damage from tampering or theft and data retention), and the implementation of

a timeline that will be determine how long the data will be stored, as well as how it will

be destroyed when it reaches expiration.

It is important that those involved in a study had knowledge of this process, as

well as the steps involved in securing reliable and valid data. The integrity, access, and

maintenance of records acquired for the purpose of research are important from several

aspects. The records keep documentation of the quality of the study, which also provides

support from a legal aspect. The information provided for demonstration of proprietary rights over the data, information about the proper conduct of the study, and support to future research.

For the purpose of this research, a full set of original data will be retained by the primary investigator to facilitate the reconstruction (if necessary) of the study. This data will be kept at a secure but accessible location in order to protect participants' confidentiality. The time frame allocated for storing this data was established as five years, based on the regulations and requirements of stakeholders and institutions involved in the study once the proposal is approved.

Protection of Human Subjects

Identifying the subjects involved in any research project or trial is the first step to upholding the ethical principles involved in the conduct of any study. The human subject (living individual) has the right to be protected at any time, and this involves protection of all the data collected through intervention or interaction with the individual, and any identifiable private information.

Participants need to feel secure and safe that no information will be disclosed, their identity will be maintained confidential, and they will not be targeted due to their responses to the survey or any data collected during the research process. They also need to understand that there are benefits to be obtained by their participation, and they are not singled out because of their gender or their ethnicity. Therefore, an informed consent will be signed by every participant acknowledging that their participation is voluntary, and

they are able to withdraw from the study at any time they feel necessary, without any

penalty.

The oral health literacy study consisted of several research (data collection) sites.

A weekly meeting was scheduled with the research committee during the duration of the

research to assure the completion of assigned tasks in a timely manner, preventing the

escalation of any situation that may cause a crisis, thus increasing the potential damage to

the study's credibility and reliability. Protocols were established in order to provide a

secure and effortless path in problem-solving and decision-making. This was made

available to all involved, for use as a reference, and for assistance in following and

adhering to it in the solutions and/or clarification of situation/problems. Immediate

attention was given to any unforeseen situation via e-mail and phone communication in

order to establish proper documentation of the necessary steps taken to correct the

situation and formalize the steps into the existing protocols to make corrections and for

subsequent studies to follow.

Protection against possible misuse of personal information is a genuine concern

for the public and another issue to deal with for public health agencies in the computer

era. Proper implementation of compatible systems will be created, thus allowing for the

creation of security protocols in the safeguarding of the collected data. Computers used in

the storage of data were protected by passwords allocated only to the primary investigator

and the analyst. No copies of hard data was allowed to be transferredd elsewhere without

the authorization of the primary investigator, and hardware devices was implemented to

provide users login and logout pass codes, and to set different privilege levels for

accessing only the level information required by the user's assigned tasks. After a period

of 5 years the data will be destroyed as required.

Chapter 4 presents the data collection process and the analysis of it using the

statistics package SPSS 21.

Chapter 4: Results

The purpose of this study was to translate, culturally adapt, and validate a Spanish version of an oral health literacy assessment tool. I used an expert panel to establish face and content validity after a translation-back-translation procedure, and test-retest field testing with random subsample to determine the validity and reliability of the translated assessment for use in the Hispanic population. In Chapter 4, I present the results of the translation process for the SREALD-30, as well as the data collection process and its results. The back-translation process is presented first, follow by the results of the study and the pertinent analysis.

Translation of the REALD-30

The translation of the REALD-30 was accomplished by using the translation-back-translation method. I contacted three independent, bilingual, and bicultural translators by email requesting translation services for the REALD-30. After reviewing their resumes and work history, I provided a copy of the English version to two of them to translate from English into Spanish (forward translation). Next, I compared both versions, and after consulting with the dissertation committee, accepted only one version. A third independent, bilingual, and bicultural certified translator who had never seen the original English version of the original instrument back translated the document from Spanish to English. An expert committee, composed by three Hispanic, bilingual, and bicultural community members, including an expert on health literacy and two dentists, reviewed each version of the forward and back-translation of the original REALD-30. A questionnaire was provided to each expert to help them determine content validity of the

new translated tool. I created a matrix with the answers (Appendix C), and after examination of the answers determined that the expert committee members arrived at a consensus that the translated Spanish version of the REALD-30 represented the meaning of the English version.

Data Collection

A total of 119 participants completed the questionnaires over a 1.5 year period in two community health centers in El Paso, Texas. Out of the 119 participants, 5 were excluded for not having completed the full set of comprehensive tests. I selected participants at random from patients waiting to be seen by their primary physician. The inclusion criteria was Hispanic adults over the age of 18 with no evident cognitive problems. Participants were excluded if they were non-Hispanic, younger than 18 years old, or unable to speak or read in Spanish. Consent to participate was obtained from all participants and a copy of the consent was given for the participants' records. I created an alpha-numeric identifier mark for each participant that consisted of the initials of the clinic followed by a three digit number from 001 to 100. This was done for the purpose of matching each questionnaire with the appropriate test for each participant. I was present for each interview and was the sole data collector administering the tests. The participants completed a sociodemographic questionnaire, the Oral Health Impact Profile-14, the SAHLSA-50, and the translated version of the REALD-30, the SREALD-30.

Of the 119 participants, 20 were randomly selected to return to complete the test-retest administration of the SREALD-30. Only 11 of the 20 participants reported back for the retest. Again, participants signed a consent form and a copy was given for their own

personal records. The new test was identified with original identifier given to the participant at the beginning and the results were matched to the original test.

Following completion of data collection, I entered the results into a Microsoft Excel data spreadsheet and then imported them into SPSS v. 21 for analysis.

Demographics

Demographic characteristics for participants in the study are presented in Table 2. Participants were majority female (63.3%) and, on average, 47 years old (*SE* 1.62). All participants were Hispanic, by study design, with a high proportion born in Mexico (66.7%) and the remaining born in the United States. For participants born outside of the United States, the mean time of residence in the United States was over 21 years (*SE* 1.46), though the range was from 1 year to 40 years. The reported income showed the majority (35.3%) of the participants receiving less than $200 of income on a monthly basis. Education level was group-based according to the educational levels of the U.S. system, as follows: primary (1st to 5th grade), secondary (6th to 8th grade), preparatory (9th to 12th/GED), and college/post-college education. Ten percent of the participants had primary education, and 63.1% had secondary education, with 19.3 % of the participants completing or partially attending to preparatory school (Table 2). In terms of dental insurance a vast majority (87or 73.3%) of the participants did not have dental insurance coverage, and 2.5% did not know their insurance status (Table 2).

Table 2

Frequencies and Percentages on Participant Characteristics

Characteristic	Total =114	%
Gender		
Male	42	36.8
Female	72	63.1
Place of birth		
USA	38	33.3
Mexico	76	66.7
Age		
18-24	11	9.6
25-34	12	10.5
35- 44	26	22.8
45- 54	28	24.5
55-64	22	7.8
65-74	9	3.5
75 and older	4	
Dental insurance status		
Dental insurance	12	10.5
Medicare/Medicaid	10	8.8
No dental insurance	87	73.3
No answer	5	4.4
Income (monthly)		
< $ 200	42	36.8
$201-400	35	30.7
$401-800	17	14.9
> $801	8	7.0
No answer	12	10.5
Education		
< 5th grade	13	11.4
6th – 8th grade	24	21.1
9th – 12th grade (GED)	49	43.0
College or above	25	21.9
No answer	3	2.6

Dental Habits and Care

The participants had the opportunity to respond to several questions about their dental care and habits, including visits to the dental provider in the past year, reasons for the visit, frequency of brushing and flossing, and who was responsible for their dental education.

When asked about brushing and flossing habits, 67.5% of the participants responded that they brush more than once a day on a regular basis, while 27.2% reported brushing only once a day, and 2.6% reported brushing occasionally or when they remember (see Table 3). In regard to flossing, 17.1% of the participants reported flossing more than once a day, 23.5% reported flossing only once a day, and the remaining 53% reported flossing once in a while, only when remembered, or not at all.

Table 3

Frequency of Brushing

Brushing	# of Participants	Percent
Never	1	0.9
Every few days	3	2.6
Once a day	31	27.2
More than once a day	77	67.5
No answer	2	1.8
Total	114	100.0

Dental Visits

The questions about dental visits included whether the participant ever received a cleaning from the dentist or dental hygienist, which was responded to positively by 82.4% of the participants. Only 5% of the participants never visited a dentist, while 48% had visited the dentist within the last year of the interview. Those who visited the dentist reported the main reason to get some help from the dental professional was to get a cleaning (37%), followed by extraction (21%) and tooth restoration (19.3%) For those who reported not visiting the dentist on a regular basis, the reasons were primarily financially based, as a 37.8% reported not having insurance, and 10.9% reported not being able to afford dental care.

Gingival Tissue Condition and Knowledge

The participants were asked about their periodontal (gum) condition in a question about whether their gums bled when brushing or flossing. Over a third (35.5%) of them responded "yes," while a 56.3% responded "no" to having bleeding gums. They were also asked to identify common signs and symptoms of gingival infection and periodontal condition, and include as many as applied. The list included swollen, red, bleeding gums; loose teeth; bad breath; and receding gums, all signs of periodontal disease. A significant percentage (68.4%) of the participants identified swollen, red, and bleeding gums as sign of gum disease, while 26.3% identified bad breath as a sign of gum disease, and 15.7% could not identify any of the symptoms or signs of periodontal disease (see Table 4).

Table 4

Signs of Gum Disease

Symptoms	Frequency	Percent
Red, inflammation	78	68.4
Bleeding	53	46.4
Bad breath	30	26.3
Loose teeth	14	12.2
Receding gums	2	1.75
Other	18	15.7
I don't know	18	15.7

Perceived Dental Health and Needs

Respondents were asked to rate their dental health from excellent to fair/poor, and also to identify perceived dental needs. Of the participants who answered the question, 2.6% rated their dental health as excellent, 37.7% as good, 39.5% as mediocre, and 19.3% as fair/poor (Table 5).

Table 5

Perceived Oral Health

Perceived Oral Health	# of Participants	Percent
Excellent	3	2.6
Good	43	37.7
Mediocre	45	39.5
Bad/poor	22	19.3
No answer	1	0.9
Total	114	100.0

A list of dental care needs was given to the participants to select from and report

which were their dental needs at the moment. To report the results, I grouped the needs

into three sections based on pre-established dental care division of treatment, such

preventative (exam, cleaning), restorative (fillings), major restorative (crown, bridge,

endodontics, dentures, and surgery). From the possible dental care needs listed on the

questionnaire, the most needed was preventive work, with 84 participants reporting it as

their main need, followed by restorative work and major treatment such as pulling teeth

(extractions) and dentures to replace missing teeth (see Table 6).

Table 6

Participants Perceived Dental Needs

	Frequency	Percent
No dental treatment	11	9.6
Preventative care	84	73.6
Restorative care	77	67.5
Major dental care	66	57.8
No answer	5	4.4

Oral Health Impact Profile 14 (OHIP-14)

As I have previously noted, this questionnaire measured the impact that oral health has in

the life of the participants. The higher the score, the less impact dental health has over the

respondents' life. The answers were grouped as follow: 0-5 points meant a significant or

high impact, 6-10 meant a moderate impact, and 11 and over (maximum of 14)

represented a minimal or no impact of dental health over the life of the participants. Of

the participants that answered the questionnaire, 13.2% score between 0-5 points, which

showed that their oral health condition has created a significant impact on their life, 22%

reported that their dental health has caused a moderate impact over their life, and 62.2%

reported no or minimal impact (see Table 7).

Table 7

Frequency of Oral Health Impact Profile -14

	Frequency	Percent
High impact	15	13.2
Moderate impact	25	22.0
No impact	71	62.2
No answer	03	2.6
Total	114	100.0

Comprehension and Reading Tests

Spanish assessment of health literacy (SAHLSA-50)

One hundred and thirteen out of 114 participants completed the SALHSA-50.

Based on their score the assessment classifies participants as having inadequate or

adequate health literacy. Participants with a score of less than 37 correct items are

classified as having inadequate health literacy levels. Of the 113 participants that

completed the test, 98 or 85.9% scored above 38 points with an adequate health literacy

level. The rest of the participants (13.2%) scored lower than 37 with an inadequate health

literacy level (Table 8).

Table 8

Health Literacy Levels on the SALHSA-50

Level of Literacy	# of Participants	Percent
Inadequate	15	13.2
Adequate	98	85.9
Incomplete Test	1	0.8
Total	114	100.0

The respondents also took the SREALD-30, the translated version that was validated in this study. The scores are comparative to the original English version, the REALD-30, where 0-13 points means a low oral health literacy level; while 14-23 equals a moderate oral health literacy level and 23-30 (highest score) indicates a high level of oral health literacy. In the study 78.9 % of the participants showed a high level of oral health literacy as measure by the SREALD-30, while 20.1 % scored with a moderate or low level of oral health literacy (Table 9).

Table 9

Oral Health Literacy Levels on the SREALD-30

Oral Health Literacy levels	# of Participants	Percent
Low	3	2.6
Moderate	20	17.5
High	90	79.0
Incomplete	1	0.9
Total	114	100.0

Correlational and Regression Analysis

In order to test the hypotheses several correlational tests were run utilizing the SPSS 21 statistical program. I transferred the data from Excel spreadsheets into the SPSS 21 software package. The variables were named and manipulated to conform to the type of analysis test that was ran. For the purpose of this study predictive validity was tested to assess whether the SREALD-30 could significantly predict, oral health quality of life or perceived oral health status, holding age, education, and dental insurance coverage constant. Both RQ1 and RQ2 corresponded to testing predictive validity of the SREALD-30.

Research Question 1. Does the SREALD-30 score predict oral health quality of life as measured by the OHIP-14sp?

$H_0 1$: The SREALD-30 score does not predict oral health quality of life as measured by the OHIP-14sp.

$H_A 1$: The SREALD-30 score predicts oral health quality of life as measured by the OHIP-14sp.

Predictive validity of the SREALD-30 on Oral Health Quality of Life was tested using Multiple Linear Regression analysis. The Dependent Variable was the Oral Health Impact Profile (OHIP-14s) scores, the Independent Variable was the SREALD-30 scores, and covariates included age, education, and dental insurance coverage. Statistical significance was set at the alpha = 0.05 level.

Multiple linear regression analysis was conducted to determine if the scores in the SREALD-30 were related to and could predict the Oral Health quality of life as measured

by the Oral Health Impact Profile-14 scores. Tables 10, 11 and 12 summarize the

statistical findings. The model with six predictors explained 19% of the variance and

produced a R^2 = .445, F(5, 107) = 5.29, p < .001. In addition the analysis showed scores

in the SREALD-30 as the strongest predictor to the scores of the OHIP-14s (Beta=0.427)

followed by the variable Age (Beta=.057) (Table 12). Furthermore, this analysis showed

the weaker contributing factor for the predictor was the scores on the gender variable

(Beta=.023). Based on these findings the null hypothesis for the Research Question 1 is

rejected.

Table 10

Multiple Linear Regression Analysis Model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.445ª	.198	.161	13.383	1.946

    a. Dependent Variable: OHIP-14

    b. Predictors: (Constant), SREALD,Edu,Gender,Age,Ins

Table 11

One Way Analysis of Predictors of OHIP-14s

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	4737.799	5	947.560	5.291	.000ᵇ
Residual	19163.564	107	179.099		
Total	23901.363	112			

    a. Dependent Variable: OHIP-14

    b. Predictors: (Constant), SREALD, Edu, Gender, Age, Ins

Table 12

Predictors of OHIP-14

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	-6.801	6.821		-.997	.321	-20.322	6.720
Age	.050	.084	.057	.602	.548	-.116	.217
Gender	-.702	2.622	-.023	-.268	.789	-5.900	4.496
Insurance	-.046	.113	-.041	-.413	.681	-.270	.177
Education	-.040	.089	-.043	-.451	.653	-.216	.136
SREALD-30	.739	.154	.427	4.805	.000	.434	1.044

a. Dependent Variable: OHIP14

Research Question 2. Does the SREALD-30 score predict oral health status? (Predictive validity)

H$_0$1: The SREALD-30 score does not predict oral health status.

H$_A$1: The SREALD-30 score predicts oral health status.

Predictive validity of the SREALD-30 on Oral Health Status was tested using Logistic Regression analysis. The dependent variable Perceived Oral Health Status was dichotomized into two categories consisting of "Excellent/Good" = 0 and "Mediocre/Poor"=1. The Independent Variable SREALD-30 score was entered as a ordinal variable, and covariates included age, education, and dental insurance coverage. Statistical significance was set at the alpha = 0.05 level.

Direct logistic regression was performed to assess the relation of several factors in the response of the participants to the question about the way they perceived their oral health (Tables 13, 14 and 15). The model contained four independent variables (S-

REALD-30 scores, Age, Insurance status and educational level). The model was

statistically significant X^2 (4, N=108) = 17.13, p = 0.04 (Table 13). The model also

explained the variance between the responses the predictors with a Cox and Snell R

square of 8.8 percent and a Nagelkerke R square of 11.9 percent (Table 14). The model

containing the predictors (Table 15) showed one of the independent variables made a

statistically significant contribution to the prediction of the self-perceived oral health

status. The strongest predictor was insurance with a p = .024. Looking into the p value for

SREALD-30 scores it showed a p =.698, which reflected a weak predictor, and

statistically nonsignificant value. Nonethless, because the overall model , I failed to reject

the null hypothesis.

Table 13

Omnibus Tests of Model Coefficients

		Chi-Square	df	Sig.
Step 1	Step	9.999	4	.040
	Block	9.999	4	.040
	Model	9.999	4	.040

Table 14

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	137.341[a]	.088	.119

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 15

Logistic Regression Analysis Predicting Perceived Oral Health Status

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
	SREALD	-.219	.412	.281	1	.596	.804	.358	1.803
	Sex	.127	.427	.088	1	.766	1.135	.492	2.621
Step 1[a]	Ins	.749	.333	5.063	1	.024	2.115	1.101	4.062
	Edu	-.334	.234	2.048	1	.152	.716	.453	1.132
	Constant	-.434	1.428	.092	1	.761	.648		

a. Variable(s) entered on step 1: SREALD, Sex, Ins, Edu.

Research Question 2a. Does the SREALD-30 have good internal reliability?

$H_0$2a: The SREALD-30 does not have good internal reliability?

H_A2a: The SREALD-30 does have good internal reliability?

Internal reliability was assessed by test-retest reliability and factor analysis of the

30 items in order to test the homogeneity of the SREALD-30. A Pearson's coefficient,

based on sample size (Cohen, 1988), higher than $r \geq .5$ was accepted and established the

correlation between the items. The factor analysis provided further information on the

dimensionality of the SREALD-30. Dimensionality similar to that of the REALD-30

would further support the internal consistency of the SREALD-30.

Research Question 2b. Are the SREALD-30 test-retest scores correlated?

$H_0$2b: The SREALD-30 test-retest scores are not correlated.

H_A2b: The SREALD-30 test-retest scores are correlated.

A factor analysis was performed to establish the unidimensionality of the translated tool. The results showed that there is only 1 factor that explains 99.6 % of the variance in the responses. This one factor or construct is oral health literacy, and the results corroborate the internal consistency of the tool.

Two sets of items were measured to establish test-retest reliability of the S-REALD-30, the test scores at the original interview and the scores for the same participants in the re-test session. The results showed a Pearson's correlation = .687, p = .020 which indicates good test-retest reliability of the S-REALD-30, consequently rejecting the null hypothesis.

Research Question 4. Does the SREALD-30 have good convergent reliability with health literacy as measured by the SAHLSA-50?

H_{04}: The REALD-30 scores and the SAHLSA-50 scores not are correlated.

H_{A4}: The REALD-30 scores and the SAHLSA-50 scores are correlated.

A Pearson's correlation was conducted in order to determine whether there were any relationships between the score in the SREALD-30 and the SALHSA-50, therefore to establish convergent validity. Table 16 shows the results of the two-tailed test of significance indicating a significant strong positive relationship between the scores obtained on the SREALD-30 and those on the SALHSA-50, $r = .857$, p < .001, therefore the null hypothesis is rejected.

Table 16

Pearson's Correlation between SREALD-30 AND SALHSA-50 scores

		SREALD	SAHLSA-50
SREALD	Pearson Correlation	1	.857**
	Sig. (2-tailed)		.000
	N	114	114
SAHLSA	Pearson Correlation	.857**	1
	Sig. (2-tailed)	.000	
	N	114	114

**. Correlation is significant at the 0.01 level (2-tailed).

Summary and Transition

This research study was designed to translate and validate the existing REALD-30 oral health literacy assessment tool. Several correlation and regression tests were used to answer the research questions.

Table 17

Research Questions Results Summary

Research Question	Null Hypothesis	Rejected/Accepted
RQ1: Does the SREALD-30 score predict oral health quality of life as measured by the OHIP-14sp? (Predictive validity)	H01: The SREALD-30 score does not predict oral health quality of life as measured by the OHIP-14sp.	Rejected
RQ2: Does the SREALD-30 score predict oral health status? (Predictive validity)	H01: The SREALD-30 score does not predict oral health status.	Failed to reject
RQ3: Does the SREALD-30 have good internal reliability?	H03a: The SREALD-30 does not have good internal reliability.	Rejected
	H03b: The SREALD-30 test-retest scores are not correlated.	Rejected
RQ4. Does the SREALD-30 have good convergent reliability with health literacy as measured by the SAHLSA-50?	H04: The REALD-30 scores and the SAHLSA-50 scores not are correlated.	Rejected

Based on the results detailed in this Chapter, the newly translated SREALD-30 assessment tool has good test-retest reliability as established by Pearson's correlation and good convergent validity with the SAHLSA-50 tool as established by Pearson's correlation test. As for the ability to predict perceived oral health status and Oral Health

Impact Profile, the SREALD-30 was successful to predict Oral Health Status but it had limitations to predict perceived oral health as established by the regression tests performed.

In Chapter 5, I provide a brief summary and interpretation of the study results, study strengths and limitations, and recommendations for future studies.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this study was to validate and translate an existing oral health literacy assessment tool from English to Spanish. The translation was done using the translation back-translation technique with the assistance of three translators and an expert committee. The translated version was validated in a correlational study design and measured against existing tools such as the SAHLSA-50, and the OHIP-14. I collected data at two sites in El Paso County, using the facilities of two clinics that serve a diversity of patients. The first clinic is associated with a major tertiary hospital with several satellite clinics around the county, and the second is associated with a private organization. This chapter includes the interpretation of results, limitations if the study, implications for social change, and conclusions of this study.

Interpretation of Results

While there have been several studies on validation and use of oral health literacy tools, at the time I undertook this research, no researchers had translated any of the existing tools into Spanish. I thus designed this study to translate and validate an existing oral health literacy assessment tool from English to Spanish language. The process involved using the translation back-translation technique with the support and input of an expert committee that included two bilingual dental professionals and a health literacy expert. I used a descriptive correlational, non-experimental design, based on the oral health literacy conceptual framework used by Horowitz (2008) and adapted from

Nielsen-Bohlman, L., M., Panzer, A. M., Kindig, D.A., Eds., Committee on Health literacy. (2004)

I developed the SREALD-30 with the aim of introducing an assessment tool to be used with the Spanish-speaking population. My use of the translation, back-translation technique and the expert committee allowed me to achieved content and face validity of the tool before testing it with the participants.

A total of 114 participants were included in this quantitative study. The participants of the study were all Hispanics, above 18 years old, able to read and speak Spanish, and had no obvious signs of cognitive impairment. The majority of the participants in the study were females (62.2%), with an average age of 47 years old ($SE =$ 1.62). The majority of the participants (63.1%) had completed the secondary level education (6th to 12th grade), and had an income level of less than $200 (35.3%).

A majority of participants (82.4%) had an adequate health literacy level score, as measured by the SAHLSA-50. A great majority (75.3%) scored with adequate or high levels of oral health literacy when measure by the SREALD-30, the tool that I designed this study to validate. This study showed that the tool was successful in predicting oral health quality of life, as measured by the OHIP-14. In testing for predictive validity of the tool using the single-question assessment of self-perceived oral health status scores to the question, "How would you rate your overall oral health?" (Atchison & Gift, 1997; Locker, 1997), the SREALD-30 predictability was limited with respect to scores of the SREALD-30, showing insurance coverage as the strongest predictor while SREALD-30 scores showed only a p =.596, which made a weak predictor. As mentioned by other

researchers, having access to or carrying an insurance card (Parker & Jamieson, 2010) and years of schooling (Lee, et al 2013; Villanueva Vilchis, Wintergerst, & Borges Yáñez, 2015) are associated with health outcomes and literacy.

In relation to testing the internal reliability of the tool and answering the research questions RQ3 and RQ4, the results showed that the scores of the first test and the re-test compared, with a Pearson's = .687. Convergent reliability was measured against the SAHLSA-50 scores showing a r = .857. These results are similar to those of Lee et al. (2007) in their creation of the REALD-30.

Since the time when I first proposed this study, Lee, Stucky, Rozier, Lee, and Zeldin et al. (2013) have published the results of a study that developed a Spanish oral health literacy assessment tool, the OHLA-S. This tool design consisted of a word recognition section and a word comprehension section. Based on the design, the tool scores included a three-part system: pronunciation and comprehension, comprehension extra credit, and pronunciation only (Lee et al. 2013). The tool achieved a reliability of 0.70, 0.78, and 0.80 respectively in each mentioned area, and a validity of $p<0.05$ when compared to all variables. Correlation of all three components were tested with linear regression models, and the researchers found that the variable "self-perceived need understanding written medical material remained a significant predictor ($B = 0.22$)" (Lee et al., 2013, p. 6). The OHLA-S also showed a high correlation to the participant's amount of years in school. After completing the study and the analysis, the authors recommended this tool for the assessment of oral health literacy in the Spanish speaking

population, although they were careful to observe that further studies might be needed with other Spanish speaking populations.

Another tool introduced in 2015, the Spanish Oral Health Literacy Scale ([SOHLS]; Villanueva-Vilchis, Wintergerst, & Borges-Yanez, 2015) is based on skills literacy, as per the Health Literacy Test developed by the Educational Testing Service. In this study the authors were able to establish a Spearman's correlation (0.426) between the test results and perceived oral health, and Pearson's correlation was 0.336 between the total test score and the OHIP-14. In addition, the results reflected a correlation ($r = .035$) between years of schooling and oral health literacy. Although construct validity was significant, the results could be improved with further testing (Villanueva-Vilchis, Wintergrest, & Borges-Yanez, 2015).

The results of my study showed comparable results to the studies mentioned above such as good test-retest reliability, but also has acceptable convergent reliability when measuring the health literacy concept. This study and its results show that the SREALD-30 is a reliable and valid tool, and thus serves as a contribution to professional and academic literature, breachs the existing gap in scholarly literature, and serve as a building block to improve decision-making processes.

Limitations of the Study

There were several limitations to this research study including the use of convenience sampling and the inclusion of self-reported information. I selected the convenience sample from patients receiving services at the clinics that served as data collection sites, leading to potential overrepresentation or underrepresentation of the

chosen population. Several efforts were made to assure that participants returned for a second interview (re-test appointment), however, some of the selected participants did not return due to transportation, health, or work-related issues. The test-retest participation $N = 11$, although not the only study with such a small representation (Motyl, Driban, McAdams, Price and McAlindon, 2013), presents a limitation for the study. While I assumed and expected that the answers to the questionnaire were honest, the data should be interpreted carefully since the survey and the data collection instruments may have been misinterpreted by the participants.

Recommendations for Further Study

The purpose of this study was to translate and validate the existing English language oral health literacy tool REALD-30 into Spanish. In addition, my intention was to answer research questions about the predictive validity of the newly translated tool, the SREALD-30. In this study I accomplished the translation of the SREALD-30, confirmed its ability to predict a patient's oral health impact profile, and confirmed its ability, although limited, to predict self-perceived oral health status. Using the results and taking into consideration the study limitations, researchers could expand the sample size and even the participant's demographic background to other Hispanic groups since in this study all participants were born in Mexico or had a Mexican background. This conclusion is similar to that of the authors of the SOHLS (Villanueva-Vilchis, Wintergerst, & Borges-Yanez, 2015), which was tested with the Mexican community, and to that of Lee et al. (2013) whose Spanish-speaking participants were mostly from a Mexican background. Subsequent researchers might also explore the relationship of oral health

literacy and dental insurance utilization, access to care, as well as the dental provider knowledge on oral health literacy and its impact on dental care recommendations.

Implications for Social Change

In this study, I have provided the dental profession and research community with an assessment tool for oral health literacy. Although another tool has been introduced since I first proposed this study (see Lee et al., 2013), it is important to understand that the translation and validation of the SREALD-30, a short clinical tool, will still allow oral health professionals to understand the dynamics and challenges experienced by Hispanics regarding oral health literacy. Furthermore, the assessment tool can be use in clinical settings to allow dental practitioners to establish a baseline of oral health literacy levels on the patients, thus permitting better communication between practitioners and patients.

Considering the results regarding correlations between educational levels and insurance status, if the newly validated tool and the results of this study are used in educational and health promotion programs, they could provide a foundation to formulate protocols for newer and/or improved conceptual frameworks specific to dentistry and oral health literacy. This and other studies serve as building blocks for researchers to expand and support other models, and they promote interdisciplinary collaboration.

Conclusion

Oral health literacy is defined as "the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate oral health decisions" (DHHS, 2000a, p. 39), and its importance to the health status of the American population has been shown in *Healthy People 2010*

(DHHS, 2000), and *Healthy People 2020* (DHHS, 2011), *Oral Health America: A Report of the Surgeon General* (2000), and in *Heath Literacy: A Prescription to End Confusion* (IOM, 2004). Among other authors, Jones, Lee and Rozier (2007), and Parker and Jamieson (2010) have shown the relationship between oral health literacy and dental knowledge, lack of dental care, self-reported poor or fair perceived dental status, and unhealthy behaviors.

Other determinant factors to achieving optimal oral health are those related to lifestyle, constitution, heredity, or environment, as well as those related to sociocultural determinants such as living conditions, education level, and cultural beliefs (WHO, 2003). In the process of meeting my goal of translating and validating the new oral health literacy assessment tool SREALD-30, it was important to establish the correlation between oral health literacy levels and oral health perception as a determinant factor for oral health. The results showed good internal correlation and validity when compared to the SAHLSA-50 and against the previous participant's scores, establishing predictive validity. This study results showed that insurance was a more determinant factor for perceived oral health than was oral health literacy, educational level, age or gender. In addition, the levels of oral health literacy based on the SREALD-30 were predictive of the oral health impact profile showing the impact of oral health in the daily life of an individual.

Given the results and noted limitations of this study, it is important to emphasize the need for further studies that could expand the study sample to other Spanish-speaking populations. These studies can contribute to knowledge on the barriers that exist and

prevent the population from achieving optimal health status in the general, and oral health in particular.

The SREALD-30, like other existing assessment tools, is mostly a reading instrument not designed to measure comprehension of the participant. Nonetheless, and regardless of this study shortcomings, considering the limited time that dental professional have to spend with each patient, the SREALD-30 may prove to be a useful method to initiate oral health education in Spanish speaking populations.

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Appendix A: Oral Health Questionnaire

Translation and Validation of the REALD-30 Study
PI-Wilma Luquis-Aponte
Walden University
155 Fifth Ave S Suite 100
Minneapolis, MN 55401

Oral Health Questionnaire
Study ID#_____

Instructions for Completing the Questionnaire
If you have agreed to participate in this study, please complete this questionnaire as honestly as possible. There are no 'right' or 'wrong' answers; I want to hear about your experiences. You do not have to answer any questions that you feel uncomfortable answering.

DENTAL HEALTH QUESTIONNAIRE

DENTAL HEALTH CARE HABITS

1. How often do you brush your teeth?

0	1	2	3	4
Never	When I remember	Every few days	Once a Day	More than once daily

2. How often did you brush your teeth yesterday?

0	1	2	3
Not at all	1 time	2 times	3 or More times

3. Who taught you to brush *correctly*?

00	1	2	3	4	5	6	7	8	9	10
No one	Myself	Parent	Brother Or Sister	Other Family member	Friend	Teacher	Dentist	Dental Hygienist	Dental Worker	Other _____

4. Do you clean between your teeth?

1	2
YES	NO

If YES, What do you use to clean between your teeth? _____

5. How often do you use dental floss?

9	0	1	2	3	4
I don't know what dental floss is. GO TO Q.9	Never GO TO Q.8	When I remember	Every few days	Once a day	More than once a day

6. If you use dental floss, how many times did you use it yesterday?

0	1	2	3
Not at all	1-2 times	3-4 times	5 or more times

7. If you use dental floss, how many times *per day* do you floss *normally*?

0	1	2	3
Not at all	1-2 times	3-4 times	5 or more times

8. Who taught you to floss *correctly*?

0	1	2	3	4	5	6	7	8	9	10
No one	Myself	Parent	Brother Or Sister	Other Family member	Friend	Teacher	Dentist	Dental Hygienist	Dental Worker	Other _____

DENTAL VISITS

9. Have you had your teeth cleaned by a dentist or dental hygienist?

9	0	1	2
Never	Not Sure	Yes	No

10. When was the last time you visited a dentist?

0	1	2	3	4	9
Never GO TO Q.12	Within the last year	About 2 years	3-4 years ago	5 or more years ago	Don't remember

1	2	3	4	5	9
Exam	Cleaning	Filling	Pain	Tooth Pull	Other

11. If you had visit a dentist what was the reason for your visit?

12. What are the reasons for you not visiting a dentist?

1	2	3	4	5	9
I don't have insurance	Can't afford it.	No dentist available in my community	Don't have transportation	I don't have any dental needs	I don't know.

CONDITIONS OF YOUR GUMS

13. Do your gums bleed when you brush or floss?

9	1	2
Don't know	Yes	No

YOUR KNOWLEDGE AND BELIEFS ABOUT GUM DISEASE

14. What is a sign of gum disease? (Circle all that apply)

1	2	3	4	5	9
Swollen, red, inflamed or bleeding gums	Bad breath constantly	Loose teeth	Gums that are pulling away from gums	Other _____	Don't know

Circle the number that best describe your agreement or disagreement about the statements

	Strongly Agree	Agree	Not Certain	Disagree	Strongly Disagree
15. Brushing my teeth can prevent gum problems.	1	2	3	4	5
16. Using dental floss can help prevent gum problems.	1	2	3	4	5
17. Going to the dentist every six months is important.	1	2	3	4	5
18. I should only visit a dentist if I am in pain.	1	2	3	4	5
19. It is normal for healthy gums to bleed occasionally.	1	2	3	4	5
20. I will lose my teeth as I get older.	1	2	3	4	5

PERSONAL INFORMATION

Please circle the number that best describe you

21. Are you:	Female	1
	Male	2

22. What was your age at your last birthday? _____
_____

23. What is your *weekly* take home income?

1	2	3	4	5	6
Below a $100	$101-200	$201-400	$401-600	$601-800	More than $800

24. What is the *highest* grade of school you completed?

0	1	2	3	4	5	6	7	8	9	10	11	12 OR GED	13	14	15	16 Or College	17+
None																	

25. Where were you born?

United States	1
Mexico	2
El Salvador	3
Puerto Rico	4
Other country: _____	5

26. If you were not born in the United States, how long have you lived in the United States?

_____Years   _____Months

27. Do you have?

1	2	3	9
Dental Insurance	Medicaid	No insurance	Don't know.

YOUR CONCERNS ABOUT YOUR TEETH AND GUMS

28. How would you rate your overall oral health?

1	2	3	4
Excellent	Good	Fair	Poor

If you were to go to the dentist tomorrow what would you want the dentist to do for you?

		Place an "X" beside each need that you have. Circle the need with most urgency.
29.	Do not need any dental treatment.	
30.	Need treatment for a tooth that hurts.	
31.	Need a checkup	
32.	Need my teeth cleaned.	
33.	Need some new fillings.	
34.	Need a tooth pulled.	
35.	Need treatment for gum disease	

36.	Have a broken tooth that needs to be fixed.	
37.	Want my teeth straightened.	
38.	Need treatment for sores in mouth.	
39.	Need to fill gaps in my teeth	
40.	Need to have all my teeth pulled.	
41.	I want to have '"gold" removed from my teeth for cosmetic purposes.	
42.	I want dentures.	
43.	Is there any other dental work that you think you need? List below	

Thank you for taking the time to fill out our survey.

Appendix B: Cuestionario de Salud Dental

Translation and Validation of the REALD-30 Study
PI-Wilma Luquis-Aponte
Walden University
155 Fifth Ave S Suite 100
Minneapolis, MN 55401

StudyID# _____
Cuestionario de Salud Dental
SALUD ORAL Y HABITOS DE CUIDADO

1. Con que frecuencia usted se cepilla los dientes?

0	1	2	3	4
Nunca	Cuando me acuerdo	Cada pocos días	Una vez al día	Más de una vez al día

2. Cuantas veces se cepilló los dientes ayer?

0	1	2	3
Ninguna	1 vez	2 veces	3 o mas veces

3. Quien le enseño a cepillarse los dientes correctamente?

0	1	2	3	4	5	6	7	8	9	10
Nadie	Yo	Padre O Madre	Hermano O Hermana	Otro miembro de la familia	Amigo	Maestro	Dentista	Higienista Dental	Trabajador dental	Otro _____

4. Usted se limpia entre los dientes?

1	2
Si	No
Si marco si, que usa para limpiar entre sus dientes?	

5. Con que frecuencia usa el hilo dental?

9	0	1	2	3	4
No sé lo que es el hilo dental **Vaya a la P. 9**	Nunca Vaya a la P. 8	Cuando Recuerdo	De vez en cuando	Una vez al día	Más de una vez al día

6. Si usa hilo dental cuantas veces usó hilo dental ayer?

0	1	2	3
Ninguna	1-2 Veces	3-4 Veces	5 o mas Veces

7. Si usa hilo dental, cuantas veces al dia lo usa normalmente?

0	1	2	3
Ninguna	1-2 Veces	3-4 Veces	5 o mas veces

8. Quien le enseño a usar hilo dental correctamente?

0	1	2	3	4	5	6	7	8	9	10
Nadie	Yo	Padre O Madre	Hermano O Hermana	Otro miembro de la familia	Amigo	Maestro	Dentista	Higienista Dental	Trabajador dental	Otro ____ ____

VISITAS DENTALES

9. Un dentista o una higienista dental le ha limpiado los dientes alguna vez?

0	9	1	2
Nunca	No se	Si	No

10. Cuando fue la última vez que visitó al dentista?

0	1	2	3	4	9
Nunca Vaya al P.12	Este año	Hace 2 años	Hace 3-4 años	5 años o mas	No recuerdo

11. Si a visitado al dentista cual fue la razón de su última visita? (marque todos que apliquen)

1	2	3	4	5	9
Examen	Limpieza	Relleno o Calza	Dolor	Sacar un diente	Otro

12. Si no ha visitado al dentista, Cuales son las razones por no hacerlo? (Marque todos las que apliquen)

1	2	3	4	5	9
No tengo aseguranza dental	No puedo costearlo	No hay dentista cerca	No tengo transportación	No necesito trabajo dental	No Se

CONDICION DE SUS ENCIAS

14. Sangran sus encías cuando se cepilla los dientes o usa hilo dental?

9	1	2
No se	Si	No

SU CONOCIMIENTO Y CREENCIA SOBRE LA ENFERMEDAD DE LAS ENCIAS

15. Cuáles son los síntomas comunes cuando las encías están mal? (Circule todos que apliquen)

1	2	3	4	5	9
Hinchado, rojo, inflamado, sangriento	Mal Aliento	Dientes Flojos	Las encías se encojen	Otro _____	No Sé

Circule el número que mejor describe si está de acuerdo o en desacuerdo sobre las declaraciones abajo:

	Firmemente Apruebo	Apruebo	No estoy seguro	Desapruebo	Fuertemente Desapruebo
15. Cepillar mis dientes puede ayudar a prevenir problemas de las encías.	1	2	3	4	5
16. Usar hilo dental ayuda a prevenir enfermedades de las encías.	1	2	3	4	5
17. Ir al dentista cada seis meses es importante.	1	2	3	4	5
18. Solo debo visitar al dentista si tengo dolor.	1	2	3	4	5
19. Las encías saludables sangran a veces.	1	2	3	4	5
20. Voy a perder mis dientes cuando envejezca.	1	2	3	4	5
	Firmemente Apruebo	Apruebo	No estoy seguro	Desapruebo	Fuertemente Desapruebo

INFORMACION PERSONAL

Por favor circule la que mejor le describa a usted:

21. Usted es:	Hombre	1
	Mujer	2

22. Cuál fue su edad en su último cumpleaños? _____

23. Cuál es su salario semanal?

1	2	3	4	5	6
Menos de $100	$101· 200	$201·400	$401· 600	$601·8OO	Más de $800

24. Cual es el nivel escolar mas alto que usted terminó?

0 Ninguno	1	2	3	4	5	6	7	8	9	10	11	12 O Certificado de Grado 12	13	14	15	16 O Universidad	17+

25. Donde nació usted ?

Estados Unidos	1
México	2
El Salvador	3
Puerto Rico	4
Otro País: _____	5

25. Si no nació en los Estados Unidos, cuanto tiempo ha vivido en los Estados Unidos?
_____ Anos _____ Meses

26. Tiene Usted?	1	2	3	9
	Seguro Dental	Medicaid	No tengo seguro dental	No se

27. Como clasificaría la salud de sus dientes y encías?

1	2	3	4
Excelente	Buena	Mediocre	Mal/ Pobre

SUS PREOCUPACIONES DE SU BOCA Y DE SUS ENCIAS

		Coloque una "X" al lado de cada necesidad que usted tenga. Circule la necesidad que tenga más urgencia.
29.	No necesito ningún tratamiento dental.	
30.	Necesito tratamiento en un diente que me duele.	
31.	Necesito un examen.	
32.	Necesito una limpieza dental.	
33.	Necesito algunos rellenos nuevos.	
34.	Necesito que me saquen un diente.	
35.	Necesito tratamiento para enfermedad de las encías.	
36	Tengo un diente roto que necesito que arreglarme.	
37.	Quiero enderezarme los dientes.	
38.	Necesito tratamiento para ulceras o fuegos en la boca.	
39.	Necesito cerrar espacios entre mis dientes.	
40.	Necesito que me saquen todos los dientes.	
41.	Quiero sacarme todo el "oro" para que mis dientes se vean mas atractivos.	
42.	Necesito caja (placas) de dientes.	
43.	Hay algún otro trabajo dental que usted piense que necesita? Descríbalo: _____	

Gracias por su tiempo!!!

Appendix C: Invitation Letter for Expert Committee Member

Wilma Luquis-Aponte, DMD, MPH
3260 N. Mesa Suite B
El Paso, TX 79902
November 14, 2012

Dr. XXXXX, DDS
[**Street Address**]
[**City, ST ZIP Code**]

Dear [**Recipient Name**]:

I am a general dentist in the El Paso area. I am also, a Ph.D. candidate in the

Public Health, Community Health Promotion and Education program at Walden

University. Currently, I am at dissertation stage and the topic is oral health literacy in the

Hispanic population. The purpose of the study is the translation and validation of an

existing oral health literacy assessment tool from English to Spanish language. This

process involves the support and input of an expert committee that includes two bilingual

dental professionals and a health literacy expert.

Based on your personal and professional background, I would like to extend an

invitation for you to serve in this expert committee. If you decided to be part of it, your

task would be to examine the Spanish language translated tool and compared it to the

English version, for content and face validity, utilizing a standard questionnaire. You

should also, know that the professional members will not receive any monetary

compensation for being part of the committee, but their names will be mentioned in the

final dissertation.

I have enclosed copies of my resume and a summary of the proposal for your review. You will see that I have an expected graduating date for September 2013. The study is supported by the university and a dissertation committee, composed of faculty members from Walden University.

If you feel comfortable enough to serve in this expert committee and would like to help me fulfill the requirements in order to complete the study and graduate, please contact me by phone at 915-XXX-XXXX or by e-mail at Wilma.Luquis@waldenu.edu. I will send you the necessary forms, the original and the translated oral health literacy tool for your evaluation and comments.

Whatever your decision, please accept my sincere thanks for your time and consideration of my request.

Sincerely,

Wilma Luquis-Aponte, DMD, MPH

Appendix D: Expert Matrix and Suggestions

	Expert #1	Expert #2	Expert #3	Dr. Gutierrez' Summary
Instrument Construction				
Are instructions clear?	Yes	Yes	Yes	No issue – consistent across 3 experts.
Is Oral Health Literacy adequately reflected?	No. I am not sure I understand beyond the explanation given in the instrument that is needed for the application of results	Yes	Yes provided the following actions are taken: Add.	Inconsistency among experts. As the goal of the study is to validate a translation, the original items are assumed to reflect oral health literacy. The study will determine the extent to which the translation measures oral healthy literacy and it would be premature to make item construction changes now. However, the second goal is to culturally adapt the instrument and those decisions may have been limited to alternative wording on translation. ==No changes recommended.==
What would you add?		Pain – dolor. 3th molars (wisdom teeth) – terceros molars (muelas de juicio)	Maybe some questions on dental hygiene.	
What would you delete?	Items 10,24,28,30 are very technical but perhaps needed—not sure			
Content Validity				
Represents domain	No. I do not see the score explained beyond the	Yes	Yes	Again, as this study is based on an established instrument, the

	article this is missing.			scoring is established. <mark>No changes recommended</mark>.
Construct Validity				
REALD-30 represents concepts or constructs	Yes	Yes	Yes	No issue – consistent across 3 experts.
Is it inclusive of important dimensions	No. Which are they? They should be extracted from the article.	Yes	No. I think maybe should add simple questions, how many times should you brush, etc.	Inconsistent response across experts. The dimensions are established by the psychometrics of the original instrument, thus expert #1's comments are not an issue for the purpose of the translation. The suggestion by expert #3 could be taken up as an extension of the validation to test some items with known low health literacy. However, this could be the goal of an entirely different study. <mark>No changes recommended.</mark>
Does it avoid excess reliable variance?	No. I not have a way to know beyond the info from the article.	Yes	Yes	Although expert #1 could not determine the information, I feel that several items that expert #1 recommended to delete under Instrument

				Construction, are too difficult for some respondents and thus may create excess variance. However, given the validation of a translation as the goal of the study I would not recommend to delete any item but to obtain the empirical data of the translation to substantiate revision of the instrument at a later point. <mark>No changes recommended</mark>.
Face Validity				
Does it represent measures of constructs?	Yes.	Yes	Yes	No issue – consistent across 3 experts.
Item Bias				
Does wording or placement of items avoid affecting responses?	Yes.	Yes	Yes provided the following actions are taken: I think some words you would only know if you have dental education	I agree with expert #3. However, the experts have raised issues outside the boundaries of the study. The population has low education, low health literacy, and poor, but the present study can only examine the validation within this context and without changing the instrumentation to

				accommodate the populations' characteristics. <mark>No changes recommended</mark>.
Consequential Validity				
Does instrument embody desirable values for discipline?	Yes.	Yes	Yes	No issue – consistent across 3 experts.
Internal Consistency				
Are items internally consistent with each component?	No. Not sure how it can be measured beyond the info from article—it needs empirical data beyond data from article.	Yes	Yes	The empirical data from the original instrument already satisfied the internal consistency component. The empirical data from the validation study will either confirm or not this consistency. <mark>No changes recommended.</mark>
Potential for Reliability				
Instrument not consistently measure Oral Health Literacy	No	No. No, it is consistent and it measures.	No	No issue – consistent across 3 experts.